AN ANANYSIS OF COMPUTER SKILLS POSSESSED BY AFIT CLASS 89S/D

THESIS

Richard C. Lenz
Captain, USAF

AFIT/GLM/LSQ/88S-41

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AFIT/GLM/LSG/88S-41

AN ANANYSIS OF COMPUTER SKILLS POSSESSED BY AFIT CLASS 89S/D

THESIS

Richard C. Lenz
Captain, USAF

AFIT/GLM/LSQ/88S-41

Approved for public release; distribution unlimited

The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information is contained therein. Furthermore, the views expressed in the document are those of the author and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the United States Air Force, or the Department of Defense.

AFIT/GLM/LSQ/88S-41

AN ANALYSIS OF COMPUTER SKILLS POSSESSED BY AFIT CLASS 89S/D

THESIS

Presented to the Faculty of the School of Systems and Logistics of the Air Force Institute of Technology Air University In Partial Fulfillment of the Requirements for the Degree of Master of Science in Logistics Management

Richard C. Lenz, B.S.
Captain, USAF

September 1988

Preface

The purpose of this study was to develop and to administer a survey for the purpose of obtaining information about the present and the future incoming AFIT students' use and knowledge of computers.

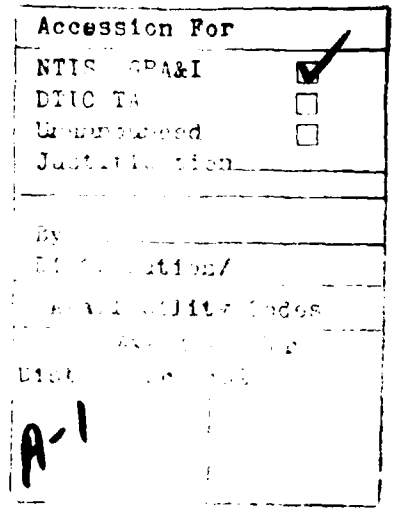
After the survey was administered to AFIT Classes 88S/D and 89S/D, the resulting data were analyzed with descriptive and nonparametric statistics. The information obtained through this analysis was provided to the faculty of AFIT.

This research was kindled from a sense of frustration that I felt at my last assignment. I had been provided with great tools in the form of computers, but the instructions to use them were provided in the form of a TAC salute (palms out, shoulders raised). With great assistance from my advisor, Lt Col Richard Peschke, I was able to focus my frustration and energy to a issue that was manageable and enjoyable. I thank him for this. I would also like to express my appreciation to Lt Col Bruce Christensen and Professor Daniel Reynolds for their assistance with the statistical analysis of the data.

Last, I'm sure that's a position that will seem appropriate to her after 15 months of AFIT, I would like to express my deepest thanks to my wife, Michelle, who has faithfully supported me in my quest for knowledge.

Richard C. Lenz

Table of Contents



List of Figures

List of Tables

Abstract

The purpose of this research was to discover the level of computer knowledge incoming AFIT students possess. This information was attained through a mail survey before the incoming class arrived. Much of the information attained from the survey is presented using descriptive statistics. Five hypotheses were tested.

The first two hypotheses attempted to correlate a respondent's college graduation date and birth date with computer knowledge. The third attempted to show a dependence between a student's program option and computer knowledge, and the fourth and fifth were tested to determine if the student's environment is dominated by a particular computer.

The research found that there is correlation between a respondent's graduation date and knowledge of a mainframe computer, but not between graduation date and a PC, and that there was no correlation between a respondent's birth date and computer knowledge. It was also determined that program options were not a good indicator of computer knowledge, and that MS-DOS computers dominate the home and work environment of incoming AFIT students.

A recommendation was made to continue the research in order to provide the demographic information to the AFIT faculty responsible for the computer courses.

AN ANALYSIS OF COMPUTER SKILLS POSSESSED BY AFIT CLASS 89S/D

I. Introduction

General Problem

The ability to use a computer should no longer be considered as a nice to have skill at the Air Force Institute of Technology (AFIT); it should be considered a requirement. Many of the students arriving at AFIT have been away from formal educational programs for several years and have not taken part in the computer revolution that has swept the educational system of this country. Incoming students may not have used a computer for anything more than playing games. When they arrive at AFIT, the realization that computers are very much a part of higher education may come as quite a surprise. Students attending AFIT are expected to use computers for everything from word processing to formulating high level mathematical models on a mainframe computer. Because of the increasing use of computers in the Air Force and at AFIT, it is imperative that incoming students either possess basic computer skills or that they are provided these skills at the beginning of the formal program.

With the increased use of computers in colleges and in offices throughout the Air Force, incoming students' computer

skills can be expected to increase each year until, eventually, AFIT will be enrolling students who are as comfortable using computers as the present class is in using hand held calculators. At that point, there will no longer be a requirement for AFIT to instruct new students in the basic use of computers. However, until such time, AFIT must provide instruction in the basic computer skills that students require, so they may devote their efforts to learning the course material instead of trying to teach themselves how to use a computer.

Statement of the Problem

In his book, Educational Psychology: A Cognitive View, David Ausubel states,

> If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly. (12:40)

The AFIT faculty has approximately four weeks in which they must prepare the incoming class to use the computing facilities of AFIT before the formal graduate program begins. Because the time is so limited, and the material so important, it is imperative that the instruction should be both efficient and effective.

In order for the AFIT faculty to develop efficient and effective introductory computer courses, the faculty needs to know what computer skills the incoming students possess. With this information, the instructors may taylor the courses

to emphasize material in which the class as a whole is weak. As an alternative, the faculty may choose to present the courses on different levels. This would insure the more advanced students are given the opportunity to increase their knowledge further, while, at the same time, students that require more training in basic computer concepts will receive that training.

Research Question, Hypotheses, and Objective

Question. There was one major question that this research was designed to answer; what is the computer experience of the incoming AFIT class, Class 89S/D? Through answering this question, this research provided the AFIT faculty with knowledge that could be used in designing the introductory computer course. This knowledge was provided to faculty members in the form of descriptive statistics such as frequency histograms and tables.

Hypotheses. Five hypotheses were tested. These are designated H_1, H_2, ..., H_5 and are as follows.

H_1: A student's level of computer knowledge is correlated with the student's college graduation date. It is believed that due to the increased use of computers in colleges, AFIT students that received their undergraduate degree more recently should have more computer knowledge. A strong correlation would support the premise that, at some point, AFIT will no longer need an introductory computer

course because incoming students would have received the required knowledge through other formal education.

H_2: A student's level of computer knowledge is correlated with the student's age. This hypothesis is related to H_1 because it is assumed that the majority of the younger AFIT students finished their undergraduate education more recently than the older respondents. Both hypotheses attempted to prove that computer knowledge is increasing due to increased exposure to computer courses in undergraduate education.

H_3: There is a correlation between an incoming student's program option and the student's level of computer knowledge. Students in some program options, like the engineering option GEM, may have more computer background because of their undergraduate degrees. If this hypothesis were true, introductory computer courses could be designed for specific program options. The reader is referred to Appendix F for an explanation of the term "program option" and for a list of related acronyms that will be used throughout the paper.

H_4: MS-DOS based computers dominate the home environment of incoming AFIT students. A survey designed to determine the computer use of AFIT students and faculty was administered in 1986 by Capt. Paul E. Luther (9). His research tested the hypothesis that MS-DOS computers

dominated the AFIT environment, and the findings of this research will be compared to his findings.

H_5: MS-DOS based computers dominate the work environment of inbound AFIT students. The importance of proving H_4 and H_5 stems from the fact that the Air Force, AFIT included, has chosen to use MS-DOS machines, Zenith Z-248s and Z-184s, as a primary source of PC computing power. If MS-DOS based machines dominate the computer environment of incoming students, those students should be better prepared to take advantage of AFIT's personal computers.

Objective. The major objective of this research was the development of the survey instrument. The survey has been designed to be administered each year to the incoming class in order to determine their computer experience. By providing this information each year to the faculty members responsible for designing the introductory computer courses, these courses should be more beneficial to the students.

Scope of the Problem

This research was limited to attaining information for use by the AFIT School of Systems and Logistics. Based on information from an earlier AFIT thesis, it was assumed that students in the School of Engineering have had more exposure to computers than logistic students, and thus their responses would bias the information being sought (9:37-39). A survey instrument similar to the one used for this research could be used to determine the same type of information for the School

of Engineering if it is felt that computer knowledge is lower than expected there.

This research was also limited to Air Force personnel attending AFIT's School of Systems and Logistics as part of Classes 88S/D or 89S/D. Responses from Class 89S/D were used to answer the research question and in testing the research hypotheses. The responses from Class 88S/D were used to provide additional data points for the hypotheses testing. Class 88S/D responses were not analyzed with descriptive statistics because there was no requirement to provide this information to the faculty.

Background

This may be the first time that an AFIT class has been surveyed, prior to their arrival, for the sole purpose of improving their computer education. This conclusion was reached after searching for similar research through the Defense Technical Information Center (5) and through Dialog with negative results, and through a discussion with Lt Col Richard E. Peschke, Head, Department of Quantitative Management (14). Because no previous research of this type has been conducted at AFIT, there are no previous results to compare this work to. The remainder of this chapter will discuss the expanding use of microcomputers by the government and the importance of good training.

The use of microcomputers in the United States is growing rapidly. Walk into an office of any size, and more

than likely there will sit a computer in place of the once familiar typewriter or adding machine. And it is not just the commercial sector that is using the machines. In order to improve productivity and quality, the federal government has also turned to the use of microcomputers.

> Federal agencies nearly doubled their purchases of microcomputers in fiscal 1985, according to a recent General Services Administration report. The GSA study found that agencies acquired 67,502 microcomputers in fiscal 1985, compared with 37,277 in 1984 and only 7,908 in 1983. (7:2)

The possibility of increased productivity and reduced paperwork has also made the microcomputer an item in high demand in the military. In fact, the demand was so high that the Air Force was forced to impose a moratorium on ordering microcomputers because they had exceeded the total authorized on the contract which had been approved by the General Services Administration (GSA)(3:51). The moratorium has since been lifted and 'Air Force officials predicted DOD personnel would buy 150,000 computers during the last year [1988] of the contract' (3:51). These machines will be used for everything from word processing to scientific research and by everyone from airmen to generals. The military is clearly making great progress in providing its members with modern computer hardware. A program to educate its members in the use of the machines has not been as clear.

Microcomputers were available at the last two units this author was assigned. Adequate training to use the machines was not available. The only formal training which new

members of the units received was essentially how to turn the computer on and how to turn it off. Everything else had to be learned through trial and error or by mimicking what one observed. The trial and error method led to problems more than once when important files were destroyed by individuals that lacked adequate training. Through discussions with peers, it is evident that inadequate computer training is a common problem throughout the Air Force. (Note response to survey question 31 on page 54 of this thesis.)

The following excerpt is from the article 'Services Under Pressure to Firm Up Standards' which was published in Government Computer News. It may serve to explain why the feeling of inadequate training prevails in the Air Force.

> Maj. James McConeghy is small-computer program manager in the Air Force Small Computer/Office Automation Service Organization, which oversees all non-contractual user and technical support for microcomputers within the Air Force. The organization also serves as DOD's primary small-computer organization under a memorandum of agreement signed by the Army, Navy, Air Force and Defense Logistics Agency.
>
> McConeghy noted that within the Air Force, nine Air Training Command employees are responsible for helping more than 90,000 small-computer users. As a result, many Air Force agencies have been forced to turn to outside vendors for training support.
>
> Because the Air Force uses commercially available software as much as possible, training is more readily available than it would be otherwise. But the Air Force did not anticipate the need for training personnel on PCs [emphasis added].
>
> 'When we first started using small computers,' McConeghy said, 'we thought they were simple and people wouldn't need the training. But the machines and software are getting much more sophisticated. The applications [that] people are using them for are much more complex. So we're finding a constantly greater need for training.' (22:65)

Apparently the Navy has the same problem. In a thesis from the Navy Postgraduate School, Lt. Cynthia S. Lassnoff states that the Navy is also buying microcomputers, but not the training on how to use them. She states that, 'State-of-the-art software and equipment are purchased but are often underutilized or, even worse, left to gather dust in a corner of the office...' (8:7). She states that the cause of this underutilization is a lack of training and goes on to recommend that training should be given the same priority as the purchase of the equipment itself.

The importance of training military leaders of tomorrow in the use of computers today has not escaped those in charge of the Air Force Academy. Incoming freshmen receive Zenith Z-248s which they are to use at the academy and then take with them (24:4). Since this is the same computer that is used throughout the Air Force, these officers already have a step up on their contemporaries in this area.

The Air Force Institute of Technology introduced microcomputers into the curriculum this past school year. As a member of the first class that was expected to rely heavily on microcomputers, I can state that it has been quite a learning experience for both the faculty and the students.

The students were provided approximately three weeks of instruction in the use of microcomputers and one week of instruction in the use of the school's minicomputers. While this instruction was a great introduction to AFIT's

computers, it did not adequately prepare us for the courses which we were to take. The lack of computer knowledge by the students led to frustration, and many wasted study hours.

Class 89 S/D will be the second class to make extensive use of microcomputers at AFIT. It could be argued that the second time will be easier just by virtue of it being the second time. This research was conducted to ensure that it will be easier the second time. Because the faculty will be aware of the level of computer knowledge the students possess, they will be in a better position to determine what should be taught in the introductory computer courses and to determine what computer skills should be required for the formal courses.

II. Methodology

Method Justification

The method of data collection chosen for this research was a mail survey. The data required for this research necessitated information be obtained from incoming students as early as possible before they arrived at the school. The available methods were the telephone survey, personnel interview, and mail survey. A telephone survey was not attempted because of the manhours that would have been required to obtain responses from all the students. Personal interviews were rejected due to the amount of traveling and coordination that would have been required to reach all the students. That left the mail survey as the method of choice. There are other reasons that made the mail survey the appropriate instrument.

Military members are often away from their home station to perform temporary duty. The mail survey insured that each student would be contacted because the survey package would be waiting for them when they returned or could be forwarded to them if they were on an extended assignment.

Another reason that a mail survey was chosen was that 'mail surveys are typically perceived as being more impersonal, providing more anonymity than the other communication modes' (6:172). Insuring anonymity was important because it was feared that if the students felt

they were being tested instead of surveyed, they may not have answered as candidly. It was important to learn what the students knew, not what they could learn before answering the questions.

The most important reason for using a mail survey is its consistency and ease of use. The computer knowledge of Air Force officers is dynamic. This means that it is not enough to survey one incoming class to determine the requirements for an introductory computer class; every incoming class must be surveyed to determine its unique requirements. A written survey mailed to incoming students before their arrival will accomplish this. With the written survey provided by this research, the computer experience of future AFIT classes may be obtained with minimum effort. If the survey is not changed, responses from future classes may be compared with the current results to determine if changes are occurring.

Measurement Instrument

General Overview. The survey consisted of a series of multiple choice questions that were designed to obtain information on demographics, background information, and computer knowledge. The following are some advantages of using the multiple choice format.

> Responses are more reliable when response alternatives are provided to the respondent, interpretation of responses is more reliable when response alternatives are provided to respondents, and multiple choice items require considerably less time per respondent answer than open-ended items. (11:Sec IV-c,1)

The survey was administered in written format, and required the answers to be marked on answer sheets that could be optically graded. Two of the questions allowed for multiple answers and required manual scoring. A copy of the survey is located in Appendix A.

The demographic portion of the survey included questions about the respondent's age, college graduation date, program option, and class. The age and graduation date were used to determine if there was a relationship between these and the level of computer knowledge. This may be useful in long range planning of computer courses at AFIT. The program option information was used to determine if different options require different levels of basic computer instruction. Students within a program option have a majority of their courses together. If it was determined that one or more of these groups were significantly lacking in computer skills, additional computer training could be provided to that one group. The class information was used to identify the respondent as belonging to Class 88S/D or 89S/D.

There were several background questions that were used to build a statistical picture of the incoming class. These questions concerned type of computer that they used, type of computer that they owned, how much the respondent uses a computer, past computer training, and familiarity with some basic types of computer programs. Responses to the questions concerning the type of computer used and type of computer

owned were particularly interesting because the larger the number of students not using IBM compatible machines, the more likely it is that additional instruction will be required. Responses to these questions, survey questions 6 and 8, were also used for hypothesis testing.

The remaining questions required the respondents to rank their computer skills, to state whether they could perform a particular computer task, and to answer multiple choice questions concerning common computer commands. These questions were used to ascertain the knowledge level of each respondent and of the class as a whole. This information was used for hypothesis testing.

Validation. There are two categories of validity; external and internal. External validity refers to the ability to generalize across persons, settings, and times (6:94). If the distribution of a sample was exactly the same as the population that it was drawn from, then the generalizations about the population based on the sample would rarely be wrong. This would be almost perfect external validity. This research attempted to obtain a census of the population which would have allowed for perfect external validity (23). But because some students did not respond, the research was conducted with a large sample. Still, with a high percent of the group being accounted for in the data, less extrapolating beyond the data was required; therefore, the generalizations should be very accurate.

Internal validity 'refers to the extent to which a test measures what we actually wish to measure' (6:94). The two types of internal validity that pertain to this research are content and construct.

'The content validity of a measuring instrument is the extent to which it provides coverage of the topic under study' (6:95). This research was designed to be used by faculty members in charge of the introductory computer courses, so it was their definition of adequate coverage that was important. In order to insure content validity, the survey was pre-tested by my thesis advisor and by two other faculty members who were interested in the outcome of the survey. Their inputs were combined and the survey was corrected. My thesis advisor then reviewed the survey a second time. Because this was the first time that a survey of this type had been used at AFIT, it was highly probable that the survey as sent was not perfect. This survey however will provide a firm foundation for the next researcher to build on.

Construct validity refers to how accurately we have measured what we really want to measure and is much more difficult to insure than content validity (6:97). Two steps were taken to enhance construct validity. The first was in the selection of response alternatives for the questions that asked the respondents to rank themselves. These responses came from a questionnaire construction manual and 'were

selected so that phrases in each set would have means at least one standard deviation away from each other and have parallel wording' (2:Sec VIII-F;1). Using these proven response alternatives lessened the probability that the responses would be biased in some manner.

The second step which was taken to insure construct validity was to pre-test the survey. Members from the present student population that were believed to have different levels of computer skills were selected to pre-test the survey. The believed difference in computer skills was based on informal observations over several months and on discussions with the students. There appeared to be a good correlation between students that were perceived by the author to have a particular level of computer knowledge and the ability to answer the survey's knowledge questions. This led to the belief that the survey instrument contained construct validity. Punctuation errors that had been noted in the pre-test were next corrected and the final copy was presented to my advisor for a final review and for printing.

Sample/Population

The survey was administered to Air Force Officers in AFIT Classes 88S/D and 89S/D. The size of each of these groups was relatively small-139 for Class 88S/D and 141 for Class 89S/D. To insure that there would be enough data for analyzing, a census of each group was taken. Taking a census

also increased the external validity of the research as discussed previously.

Data Collection Plan

Evidence of Data Validity. Another benefit to conducting a census not mentioned above was the ability to be able to define the distribution for some variables in the population. Because the response rate of the students was not 100 percent, the findings of this research must be generalized to the population. By knowing the population distribution, it was possible to test the sample of the population that did respond to determine if the distribution of the sample was the same as the population. If it was, then there would be evidence that the research findings should apply well to the population.

One of the variables of the population that was known was the program option for each member. A chi-square goodness of fit test was performed to determine if the sample had the same distribution as the population. The null hypothesis for this test was that the distribution function of the observed random variable program option is the same as the population's. The value of the test statistic for Class 88S/D was found to be 6.545 and the value for Class 89S/D was found to be 3.296. Both of these were well below the critical chi-square value of 15.51 for an alpha of 0.05 and 8 degrees of freedom. Therefore the null hypothesis is not rejected and the distributions are considered to be the same.

A visual representation of the count values for both the population and sample of each class is presented in Figure 1.

Details of collection. A survey package was sent out the first week of March, 1988 to Class 89S/D. The package contained a cover letter stating the purpose of the survey, the survey itself, and a stamped envelope addressed to the author, care of AFIT/LS. The first week of April, 1988 a letter describing the research and instructions for the survey were sent to Class 88S/D on AFIT's electronic mail (E-mail) system. The survey, answer sheet, and an instruction sheet were then placed in the student mailboxes two days later. These surveys were collected in a box located in the student lounge.

The response rate was excellent compared to the expected 10 to 50 percent for a random survey (19:241-242) and compared to the results obtained by Capt Luther when he surveyed a similar population (9:27). Of the 139 surveys sent to Class 88S/D, 106 were returned for a response rate of 76.26 percent. Of the 141 surveys sent to Class 89S/D, 119 were returned. Three of the 119 surveys were returned because the addressee had moved with no forwarding address. Two answer sheets were discarded because the survey had been completed improperly. The 114 responses out of 138 possible responses equated to an 82.6 percent return rate.

Scoring. The data from the answer sheets was read into two data files, one for each class, on a VAX minicomputer

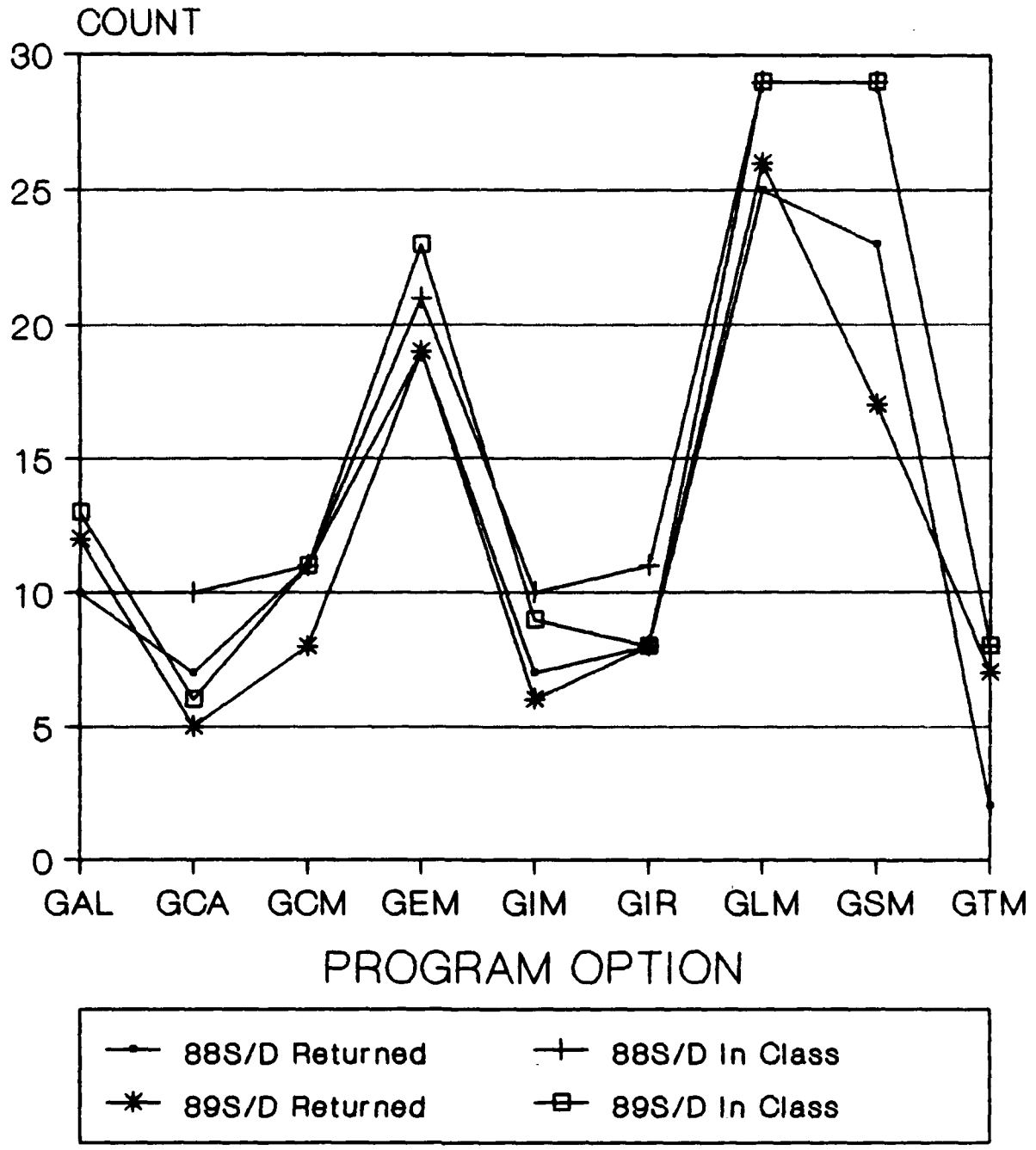


Figure 1. Comparison of Population to Sample Sizes For Classes 88S/D and 89S/D

through the use of an optical scanner. Two of the questions allowed for multiple answers and these had to be manually input into the data file. It was believed that a large number of incoming students would not know their program option when they took the survey. For this reason, the answer sheets were assigned to the students by number. When the answer sheet was returned, if a program option was not identified, it was determined by matching the number to the name and then manually inserted into the data file. A printout of the raw data was obtained and edited to ensure that the optical scanner had correctly scored the answer sheets. Several responses had not been picked up by the scanner due to light markings, and these responses were input manually.

The two edited data files were used as the independent variables-CLASS88 and CLASS89. A copy of each of these files was transferred into a third file. This combined data file became the independent variable, COMBINED. Once the subjects had been isolated into these groups, their responses to the questionnaire could be used to provide a description of the group through the use of frequency tables and histograms or hypothesis testing could be accomplished.

Identification of variables. Variables have the property of taking on at least two values or properties. When performing hypothesis testing, there is an independent variable and a dependent variable. The independent variable

is the assumed cause, and the dependent variable is the presumed effect (15:53-54).

The independent variables used in the SAS program for this research were CLASS88, CLASS89, COMBINED, COLLEGE, BDATE, and OPTION. For a description of SAS and the SAS files used in this research, see Appendix B. The variables-CLASS88, CLASS89, and COMBINED-were used to test H_4 and H_5. They allowed the respondents to be divided into different groups based on which class they were in. CLASS89 was the independent variable for all the descriptive statistics presented in this research.

The independent variable COLLEGE was used in testing H_1. It represented the year in which the respondent obtained their undergraduate degree. Higher values indicated that the respondent had graduated more recently. This variable was treated as interval data.

The independent variable BDATE was used in testing H_2. It represented the year in which the respondent was born. By using the birth year, and not the age, if younger students possessed more computer knowledge as hypothesized, the observed correlation would have shown as positive. This would be a result of the dependent variables increasing as the value of the independent variable, BDATE, increased. This data was treated as interval data.

The independent variable OPTION was used in testing H_3.

It represented the program option of the respondent. This variable was nominal in nature.

The dependent variables used for this research consisted of the responses to survey questions 1-34 for the descriptive portion of the research and consisted of MSCORE, VAXSCORE, and TSTSCORE for the hypothesis tests. The variables used for the descriptive statistics will be described in chapter four with the findings.

MSCORE was a dependent variable created from survey questions 41-57. The questions were treated as a test of MS-DOS knowledge. A 'YES' answer was given a score of one and a 'NO' answer was given a score of zero. The responses of each individual were tallied separately and became the variable MSCORE. The same scoring system was used with survey questions 58-68. This dependent variable was treated as a test of VAX knowledge and was given the name VAXSCORE. MSCORE and VAXSCORE were used as ordinal data.

Survey questions 69-75 were graded by giving a score of one for the correct answer and a zero for any other answer. The sum of the individual scores became the variable TSTSCORE. This variable represented knowledge of both MS-DOS and VAX systems and was treated as ordinal data.

The dependent variable that was used to test the hypothesis--the computer that dominates the incoming AFIT students' home environment is MS-DOS based--was the response to question number six, 'What type of personal computer do

you own?' The fourth choice to this question, 'I do not own a personal computer' was removed when running the test because it did not constitute a computer preference.

The dependent variable that was used to test the hypothesis-the computer that dominates the incoming AFIT students' work environment is MS-DOS based-was the response to question number eight, 'What type of computer do you use at work?' The fifth choice to this question, 'I do not use a computer at work,' was removed when running the test because it did not represent a computer type.

Assumptions and Limitations. A major assumption in this research was that Class 88S/D answered the survey based on the knowledge that they possessed when they arrived at AFIT. This was requested of them in the instructions provided through E-Mail and on the instruction sheet provided with the survey. The responses provided by Class 88S/D were statistically very similar to Class 89S/D, so the assumption appears to be a valid one.

Data from Class 88S/D was obtained in order to have more data points when performing the hypothesis tests. This was desired because many of the nonparametric statistics require large samples and because the larger the combined data set could be made, the more accurate the generalizations about future AFIT classes should be. Throughout this research, Class 88S/D findings are always accompanied by Class 89S/D findings. It should be remembered that the former probably

contains some inaccuracies due to the time period that the survey was administered.

Another reason for collecting data from Class 88S/D was to demonstrate the procedure for comparing AFIT classes. By conducting this research every year, changes in the computing abilities of incoming students may be tracked. This will provide the faculty of AFIT's School of Systems and Logistics a powerful tool; they will know what the learner already knows.

Statistical Tests

The Spearman rank correlation coefficient was used as the test statistic to test H_1 and H_2. The Spearman rank correlation coefficient is a nonparametric statistic that "uses the ranks of the measurements to determine a measure of correlation" (11:768). This measure of correlation "requires that both variables be measured in at least an ordinal scale so that the objects or individuals under study may be ranked in two ordered series" (20:202). The independent and dependent variables used to test H_1 and H_2; COLLEGE, AGE, MSCORE, VAXSCORE, and TSTSCORE met this requirement. The null hypothesis for a generic test using the Spearman rank correlation coefficient is that "there is no population correlation between ranks," and the alternate hypothesis is that "there is a population correlation between ranks" (11:770).

For the test of H_1, the independent variable COLLEGE was tested for correlation against the dependent variables MSCORE, VAXSCORE, and TSTSCORE. The null hypothesis for this test was that there is no correlation between when a student graduated from college and the values obtained for the dependent variables. The rejection region, or alpha, was chosen so that the probability was 0.05 that it would contain the test statistic when the null hypothesis was true.

For the test of H_2, the independent variable AGE was tested for correlation against the dependent variables MSCORE, VAXSCORE, and TSTSCORE. The null hypothesis for this test was that there is no correlation between a student's age and the values which were obtained for the dependent variables. The alpha chosen for this test was 0.05.

Two statistical tests were performed for H_3. The first test was a chi-square test for independence. This test is a form of contingency table analysis. The assumptions for this test are that the observations come from a random sample and that each observation may be classified into exactly one category of each variable to be tested (4:155).

One of the requirements of a chi-square test is that no more than 20 percent of the cells can have an expected cell count of less than five, and no cell may have a cell count less than 1 (20:110). In order to meet these requirements, the values of the dependent variables had to grouped into two categories. For example, MSCORE went from having 18

categories, 1, 2, ..., 18, to having two, 0 to 8 and 9 to 17. It is obvious from this example that much of the information in the data will be lost, so this test may be suspect. However, until more data can be obtained, this grouping must be accomplished.

In an attempt to keep the method of grouping the data from influencing the results, several groupings were tested. The first grouping, called HALF VALUE, grouped the data into categories that were half as large as the base variable's range. For example, if the range of possible values was 18, then the categories would be 0 to 8 and 9 to 17. The second grouping, called MEAN, was divided so that one category consisted of values less than or equal to the grand mean score for the variable, and the other category contained values that were greater than the grand mean. The third grouping, called MEDIAN, was divided so that one category consisted of values less than or equal to the grand median value for the variable, and the other category contained values that were greater than the grand median.

The null hypothesis for this test is that the value for the sub-variables of MSCORE, VAXSCORE, and TSTSCORE, as discussed above, are independent of the student's program option. The alternate hypothesis is that the two are not independent. The alpha chosen for this test was 0.05.

The second statistical test used for H_3 was the median test. This test is designed to examine whether several

samples came from populations having the same median' (4:167). The assumptions for this test are that each sample is random, that the samples are independent, that the measurement scale is at least ordinal, and that 'if all the populations have the same median, then all populations have the same probability p of an observation exceeding the grand median' (4:167-168).

The null hypothesis for a generic median test is that 'all populations have the same median,' and the alternate hypothesis is that 'at least two of the populations have different medians' (4:168).

For this test, the independent variable was OPTION, and the dependent variables were MSCORE, VAXSCORE, and TSTSCORE. The null hypothesis for testing H_3 was that all the program options would have the same median, and the alternate hypothesis was that at least two of the options have different medians. The alpha chosen for this test was 0.05.

A test of an hypothesis about multinomial probabilities was used to test H_4 and H_5. This test is used to determine if there is a preference between selection choices. The properties of the test are as follows:

1. The experiment consists of n identical trials.
2. There are k outcomes to each trial.
3. The probabilities of the k outcomes, denoted by p_1, p_2, ..., p_k, remain the same from trial to trial, where $p_1 + p_2 + \ldots + p_k = 1$.
4. The trials are independent.
5. The random variables of interest are the counts n_1, n_2, ..., n_k in each of the k cells. (15:790)

The test statistic for this test is a chi-square with 'k-1' degrees of freedom.

The null hypothesis for a test of an hypothesis about multinomial probabilities is that the observed probabilities equal the expected probabilities. The alternate hypothesis is that 'at least one of the multinomial probabilities does not equal its hypothesized value' (11:792).

The independent variables for testing H_4 were CLASS88, CLASS89, and COMBINED. The dependent variable was the response to survey question number 6. The null hypothesis for this test was that there was no preferred microcomputer for the incoming students' home environment. The alpha chosen for the test was 0.05.

The independent variables for testing H_5 were CLASS88, CLASS89, and COMBINED. The dependent variable was the response to survey question number 8. The null hypothesis for this test was that there was no preferred computer system in the incoming students' work environment. The alpha chosen for the test was 0.05.

III. Findings and Analysis

Description of Survey

The survey used in this research was designed to obtain information about incoming AFIT students' use of computers and their computer knowledge. The survey consisted of 75 multiple choice questions that required answers be marked on an answer sheet that was capable of being graded with an optical scanner. The survey was mailed to incoming students approximately two and a half months before their arrival at AFIT. It was also administered to the present class in order to obtain additional data for hypothesis testing.

Recording of the Findings

The first 30 questions of the survey were used to statistically describe the incoming class in the form of frequency tables and histograms. A table for each of these 30 questions, along with the remaining 45 questions and the raw data, may be found in Appendix D.

The remainder of this section will be devoted to descriptive statistics of Class 89S/D. The information will be presented in tables and graphs of the responses presented as percentages. The survey responses shown on the table or in the graph may be slightly different than that on the original survey due to space limitations. Questions dealing with similar information will be presented together, even though this may be out of sequence with the survey itself.

The numbers pertaining to the questions will reflect those of the survey.

Figure 2 clearly shows that the majority of incoming AFIT students have at least been exposed to personal computers.

Have you ever used a personal computer?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	101	88.6	101	88.6
No	13	11.4	114	100.0

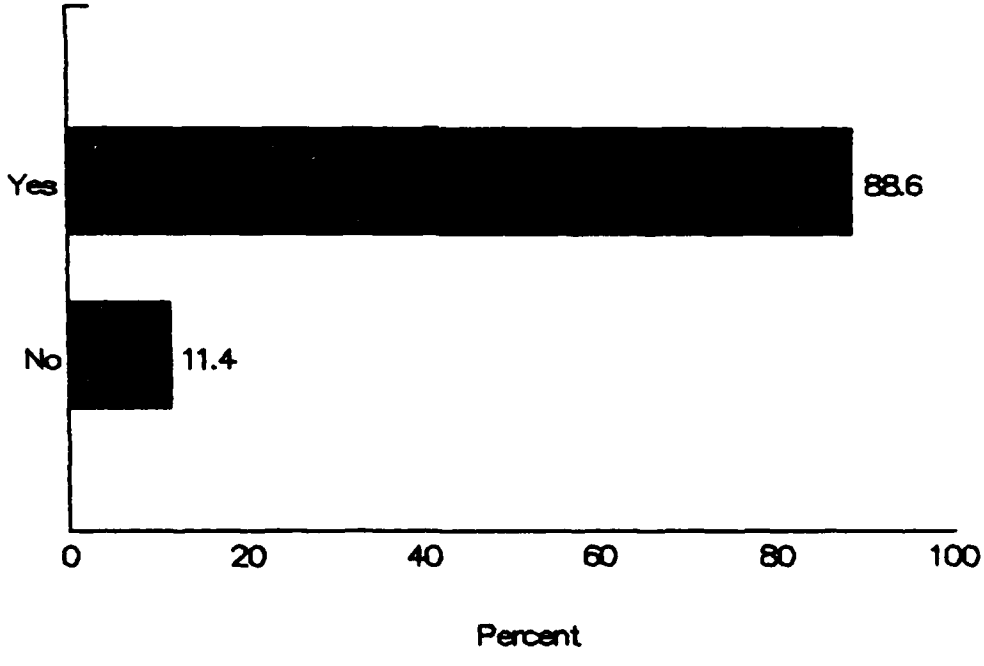


Figure 2. Responses to Question 1

Figure 3 indicates that a large percentage of the respondents have been using PCs for more than a year, and only 10.5 percent were not using a PC when the survey was conducted. One conclusion that can be drawn from this data is that there should be plenty of 'corporate knowledge' available to help the incoming students who have less computer experience.

How long have you been using a personal computer?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0 - < 6 mo	24	21.1	24	21.1
6 - < 12 mo	13	11.4	37	32.5
12 - < 24 mo	13	11.4	50	43.9
24+ mo	52	45.6	102	89.5
Do not use	12	10.5	114	100.0

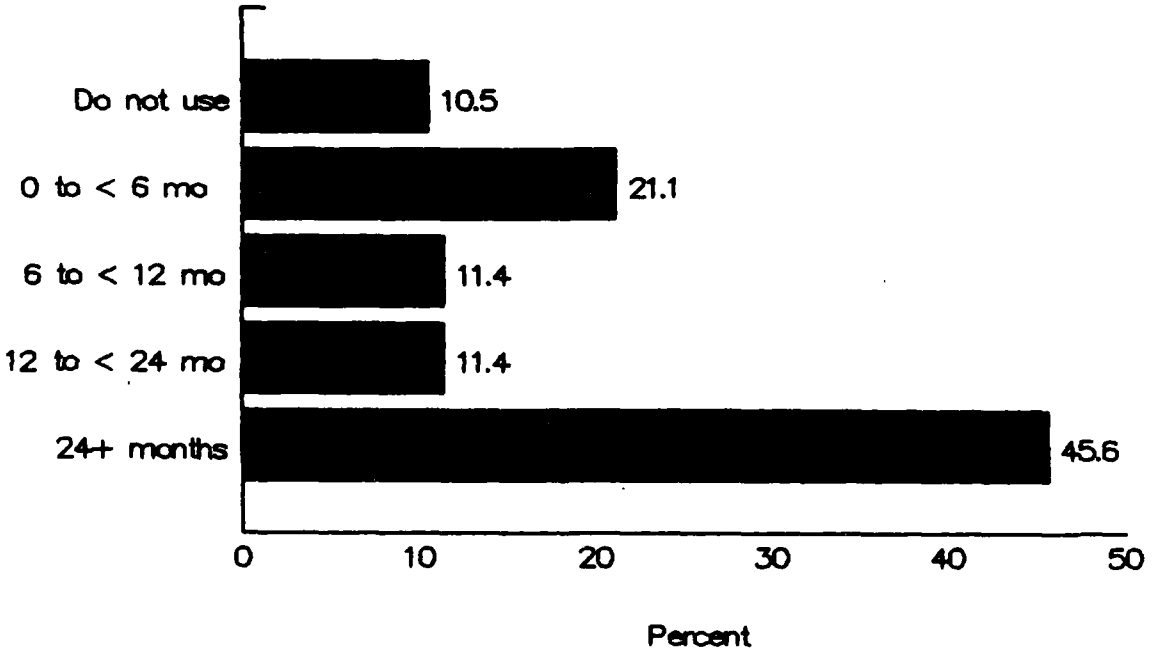


Figure 3. Responses to Question 2

The information in Figure 4 describes the average number of hours per day a respondent was using a PC at the time of the survey. It was believed that the more a student was using a PC, the less instruction they would require. A very large number, 71 percent, were using a PC less than one hour a day.

How many hours a day on average do you use a personal computer? (Office and home time combined)

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0 - < .5	53	46.5	53	46.5
.5 - < 1	28	24.6	81	71.1
1 - < 2	20	17.5	101	88.6
2 - < 4	10	8.8	111	97.4
4+	3	2.6	114	100.0

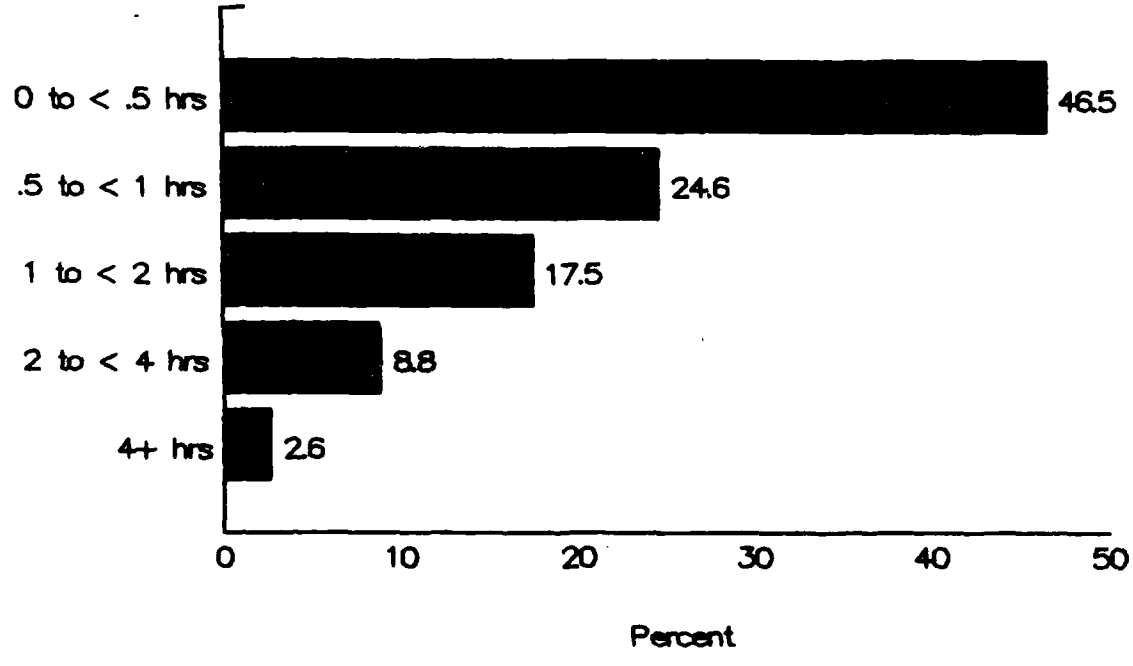


Figure 4. Responses to Question 9

The respondent's primary use of the PC is described in Figure 5. More than half of the respondents use the PC primarily for work.

The personal computer is primarily used for:

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Recreation	8	7.1	8	7.1
Education	7	6.2	15	13.3
Work	60	53.1	75	66.4
Home Mgt	19	16.8	94	83.2
Do not use	19	16.8	113*	100.0

* There was one missing response.

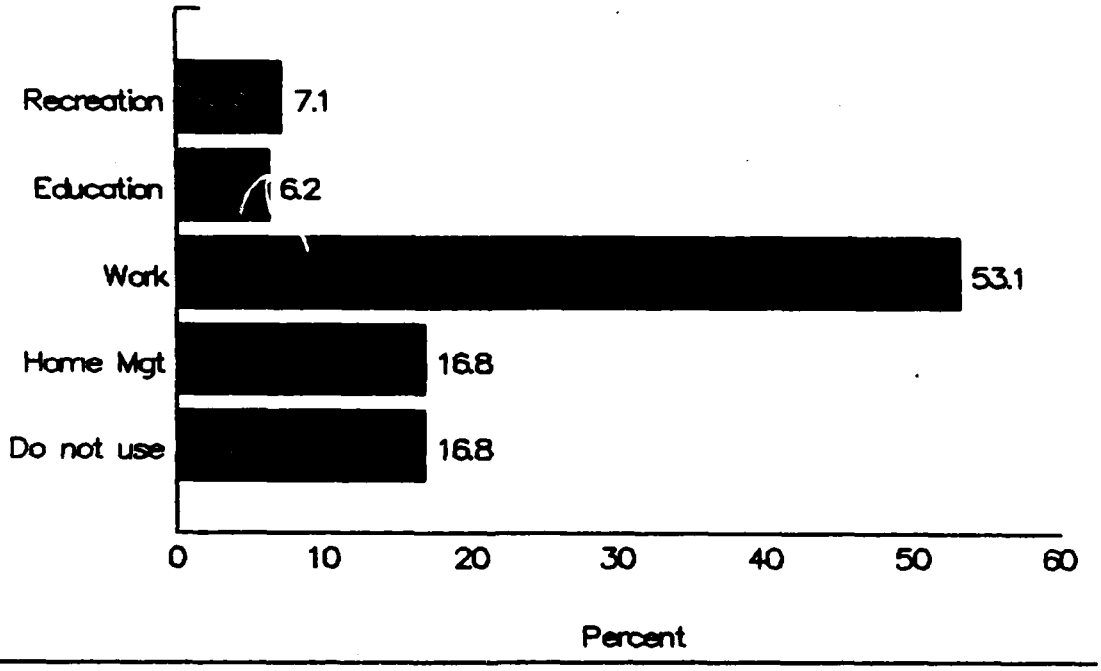


Figure 5. Responses to Question 10

The next figure, Figure 6, addresses the type of personal computer owned by the respondents at the time of the survey. Almost half of the incoming students do not own

What type of personal computer do you own?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MS-DOS	30	26.3	30	26.3
Apple Based	9	7.9	39	34.2
Other	17	14.9	56	49.1
MS & Apple	1	.9	57	50.0
MS & Other	2	1.8	59	51.8
Do not own	55	48.2	114	100.0

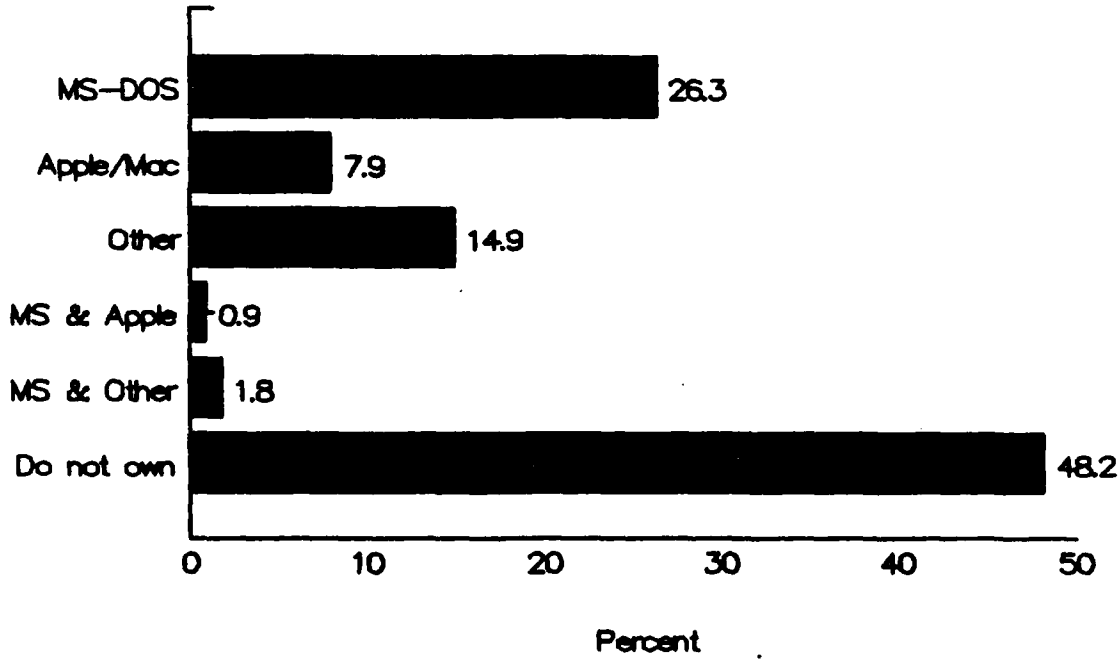


Figure 6. Responses to Question 6

their own computer. Many of these students may buy a computer as a tool to use in obtaining their masters degree. It would benefit these students if AFIT were able to give them a list of requirements that a computer should possess in order to run all the software used in AFIT courses. Since the MS-DOS based computer is the choice of the Air Force as indicated by the GSA contract discussed in Chapter I of this

thesis, it would be logical for instructors to highlight the benefits of such machines. If the students use an MS-DOS based machine for their work at AFIT, they will be better able to use the equipment that they will likely find at their next assignment.

A survey was recently sent to graduates of AFIT in an attempt to determine what computing skills are required of them after leaving AFIT (10). If that survey shows that MS-DOS computers dominate the work environment of AFIT graduates, as this researcher predicts they do, that would be one more reason to stress the importance of learning MS-DOS.

This question, survey question 6, was one that allowed for more than one response. Multiple responses were tallied by hand, and the data file was edited to reflect the multiple responses. The responses from this question will also be used to test the hypothesis that MS-DOS based computers are dominant among AFIT students. The statistical results of this test will be presented in the following section.

Survey questions 3, 4, 11, and 12 pertained to the student's use of a mainframe computer. Question 3 is represented in Figure 7. This depicts the number of students who have used a mainframe computer at some time. Although it is unlikely that all of the respondents who answered 'yes' to this question have used the VAX, which is what the majority will use at AFIT, having had some experience with a mainframe should make working with AFIT computers easier.

Have you ever used a mainframe computer?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	77	67.5	77	67.5
No	37	32.5	114	100.0

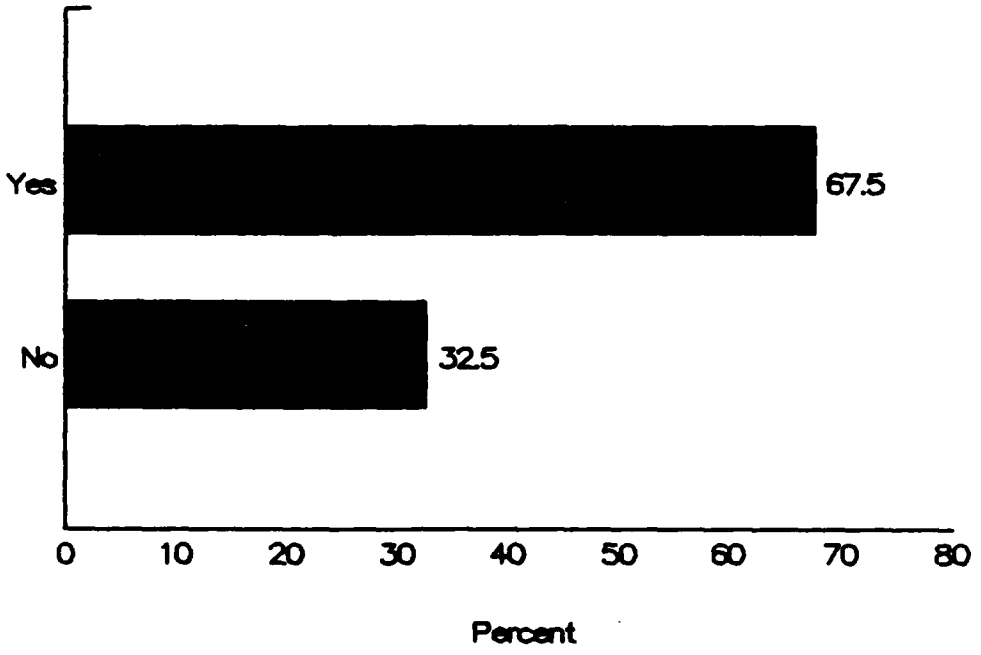


Figure 7. Responses to Question 3

Figures 8 and 9 address question 4 and 11 by displaying the length of time a respondent has been using a mainframe. Figure 8 represents the number of months a respondent has been using a mainframe and Figure 9 represents the average number of hours per day that the machine is used. Although the first answer to question 4 received 26.3 percent of the responses, this number may not be a true indicator of the populations computer usage. A fault in the survey was assigning zero as the minimum value for the first response.

How long have you been using a mainframe computer?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0 - < 6 mo	30	26.3	30	26.3
6 - < 12 mo	10	8.8	40	35.1
12 - < 24 mo	11	9.6	51	44.7
24+ mo	21	18.4	72	63.2
do not use	42	36.8	114	100.0

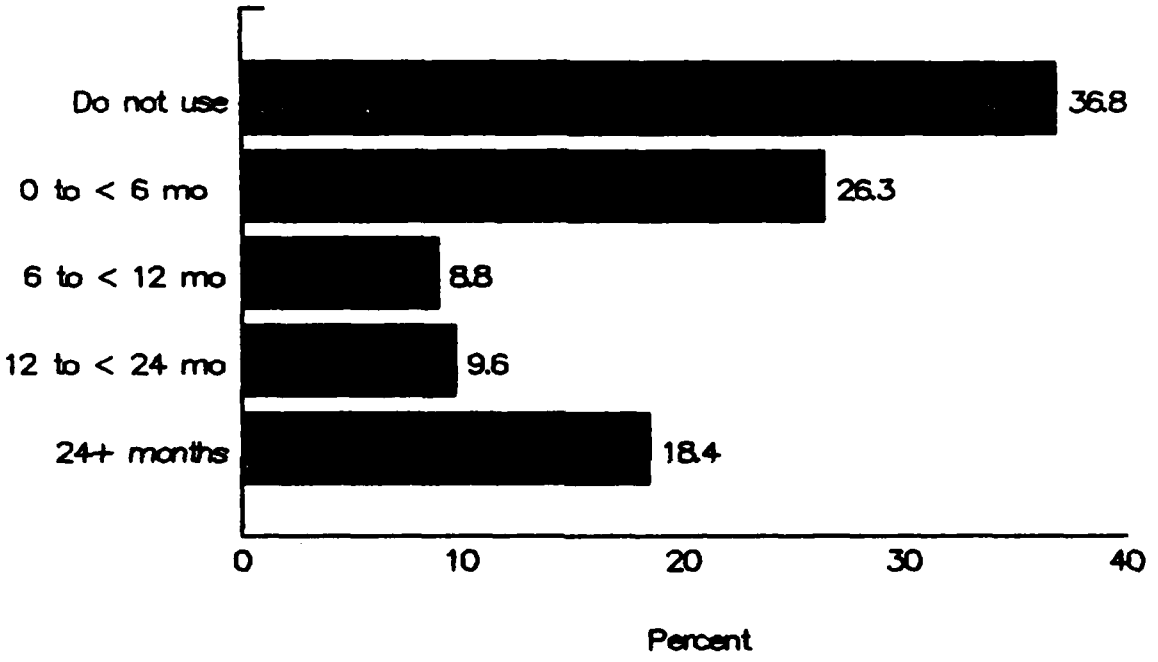


Figure 8. Responses to Question 4

Although I offered the selection, "do not use a mainframe computer," respondents who do not use a mainframe may still have marked the first answer since it contained zero. As a class, more than one in three of the incoming students has been using a mainframe computer for at least six months.

The main point to be gained from Figure 8 is that although more than a third of the respondents use a mainframe

How many hours a day do you use a mainframe computer?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0 - < .5	101	88.6	101	88.6
.5 - < 1	9	7.9	110	96.5
1 - < 2	2	1.8	112	98.2
2 - < 4	2	1.8	114	100.0
4+	0	0.0	114	100.0

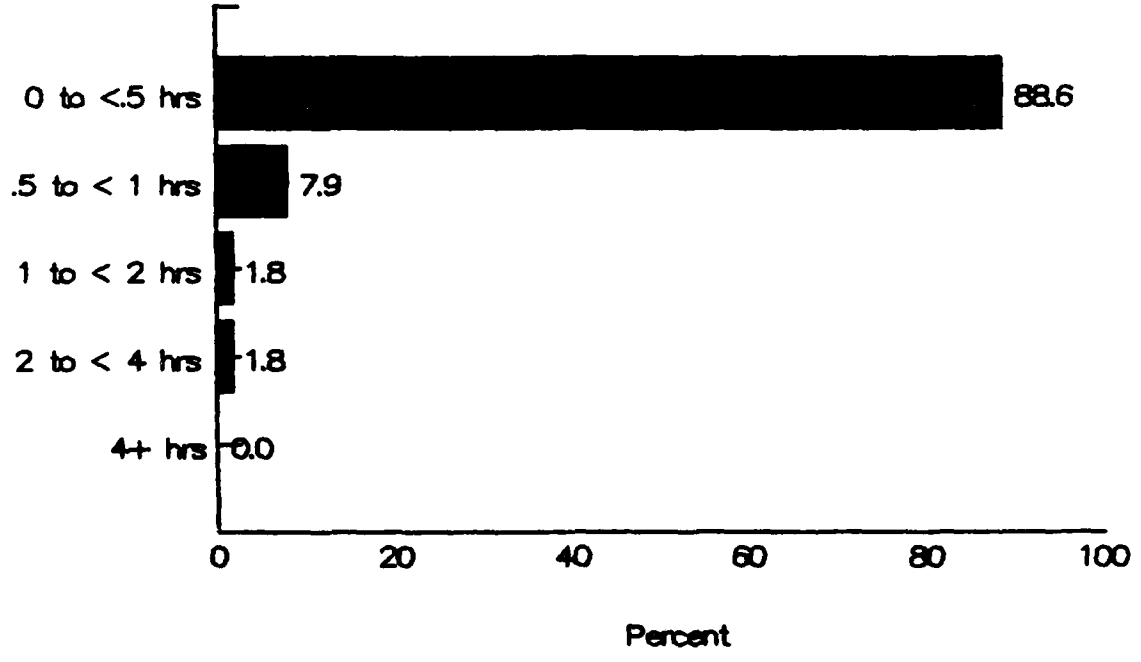


Figure 9. Responses to Question 11

computer, few of them spend a large amount of time using it. Since the mainframe is used at AFIT for several courses and the incoming students' use of mainframes has been minimal, it may be appropriate to devote a larger portion of the introductory computer course to the use of AFIT's mainframe computers. Or as an option to this, courses should be designed so as to take advantage of the software that is

available for the PCs and that minimize the use of the mainframe. For those courses that cannot be taught by using only PC software, the instructors should provide just enough instruction on the mainframes to accomplish the course objectives.

Figure 9 shows that the mainframe computers are used much less than the PCs (Figure 4). One explanation for this is that it may be difficult to get access to a mainframe at some bases whereas PCs are becoming more abundant. With the wide assortment of software available for the PCs and with their new found power, attributable to the 80286 and 80386 processing units, there is less and less of a requirement to use a mainframe computer.

Figure 10 suggests that a little more than a third of the respondents were using a mainframe before they arrived at AFIT and that the major use of the mainframe computer was work related. The number of respondents using a mainframe was higher than expected by this researcher, but not high enough for AFIT to reduce the mainframe portion of the introductory computer course.

Questions 13, 16, and 17 were asked to obtain information concerning the formal computer education which a respondent had received. At the time the survey was developed, it was thought that having had any formal computer education would be important because no matter how basic the

The mainframe computer is primarily used for:

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Recreation	0	0.0	0	0.0
Education	4	3.5	4	3.5
Work	42	36.8	46	40.4
Home Mgt	0	0.0	46	40.4
Do not use	68	59.6	114	100.0

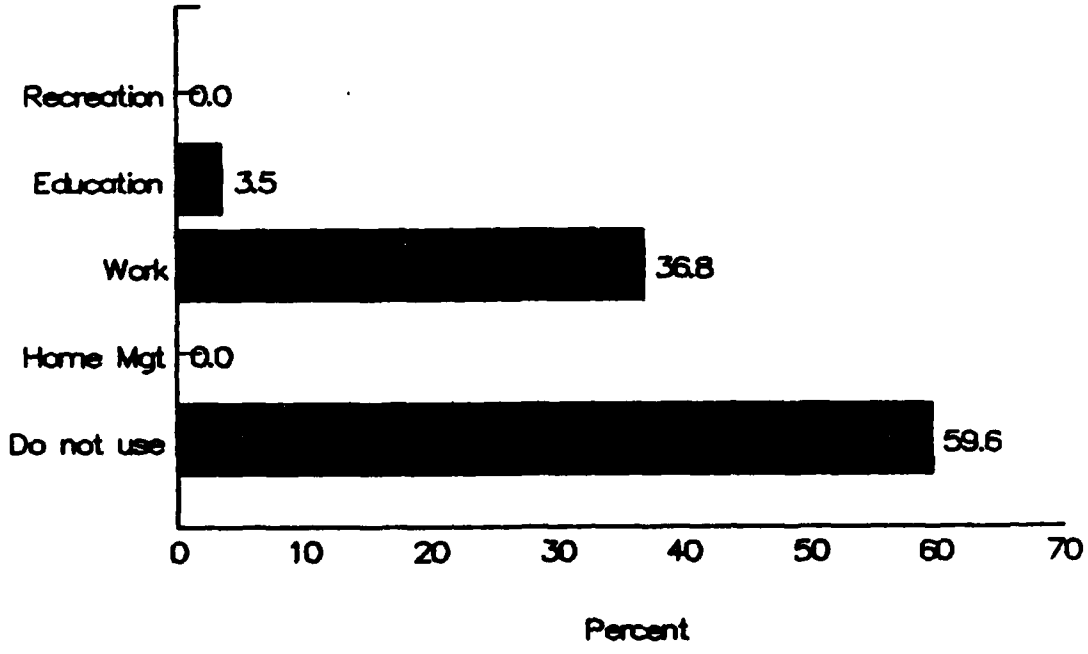


Figure 10. Responses to Question 12

training was, it should have added to, or at least reinforced, the computer skills of those attending the class. In analyzing the survey, it was discovered that knowing what type of courses a respondent had taken would have been beneficial. As Figure 11 indicates, a little more than two-thirds of the respondents were required to take computer courses for their undergraduate degree. Several colleges and

universities are now requiring their students to own a computer (13). Figure 12 shows the number of incoming AFIT students that were required to own computers in order to

Were you required to take computer courses for your undergraduate degree?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	78	68.4	78	68.4
No	36	31.6	114	100.0

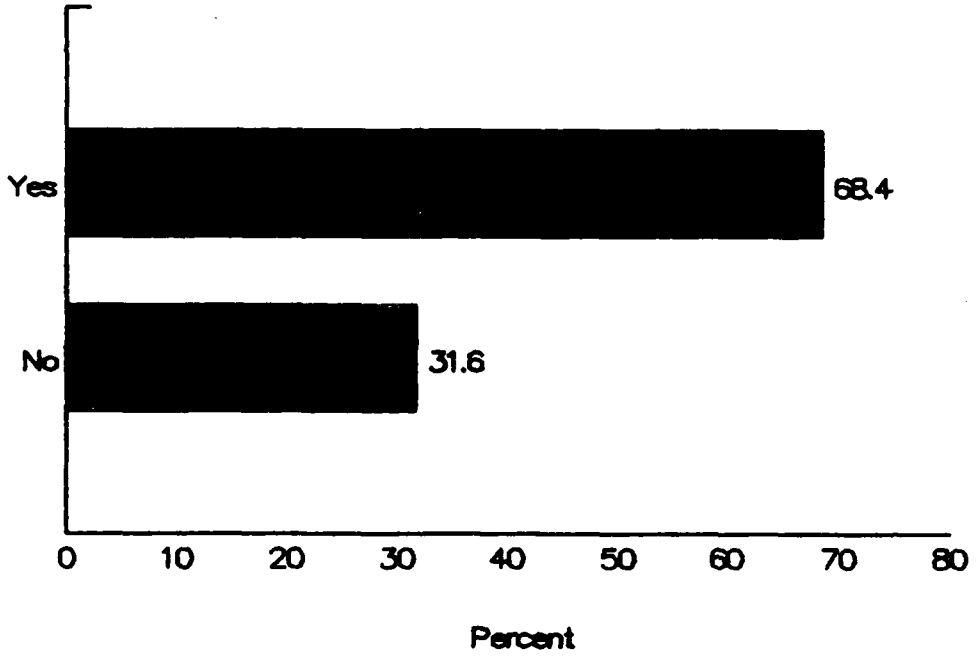


Figure 11. Responses to Question 16

obtain their undergraduate degree. This value was smaller than the researcher had expected, but it was easily accounted for. The article referenced above names several colleges and universities that require their students to own computers,

but this only started occurring about 1984. Since the average year of graduation for Class 89S/D was 1982, most were not exposed to this growing requirement.

Were you required to own a computer at the institution from which you obtained you undergraduate degree?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	1	0.9	1	0.9
No	113	99.1	114	100.0

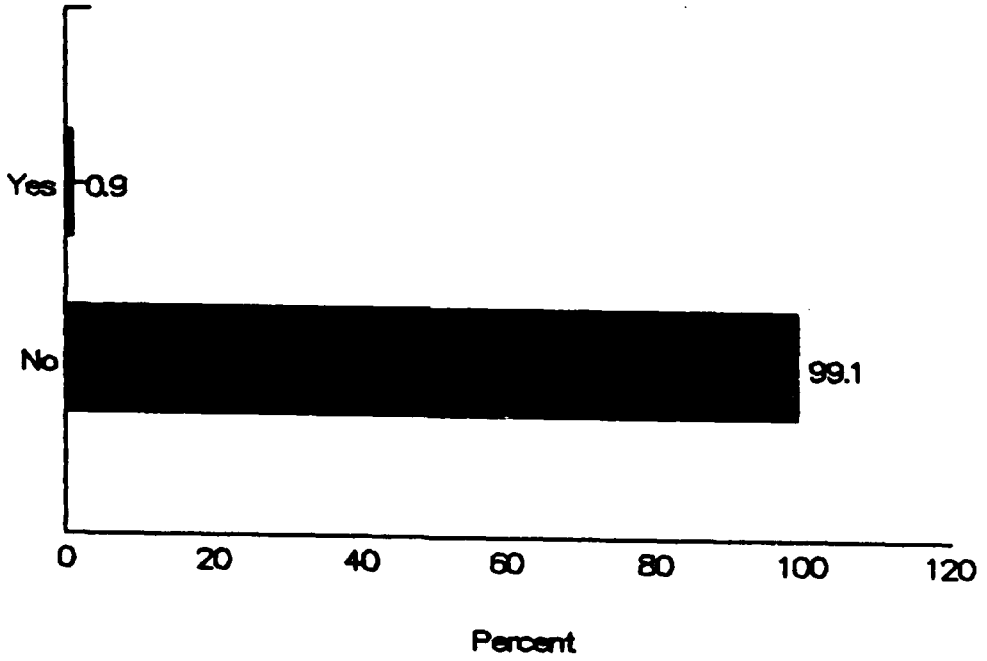


Figure 12. Responses to Question 17

The last education question to be discussed, question 13, was asked in order to determine what percentage of the students had received some formal training in the use of computers. From Figure 13, it may be determined that a large

majority of the students have had previous formal training in the use of computers. Although the type of training was not established, the fact that such a large number of the respondents have had formal training is encouraging.

Have you ever had any formal instruction on the use of computers?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	96	84.2	96	84.2
No	18	15.8	114	100.0

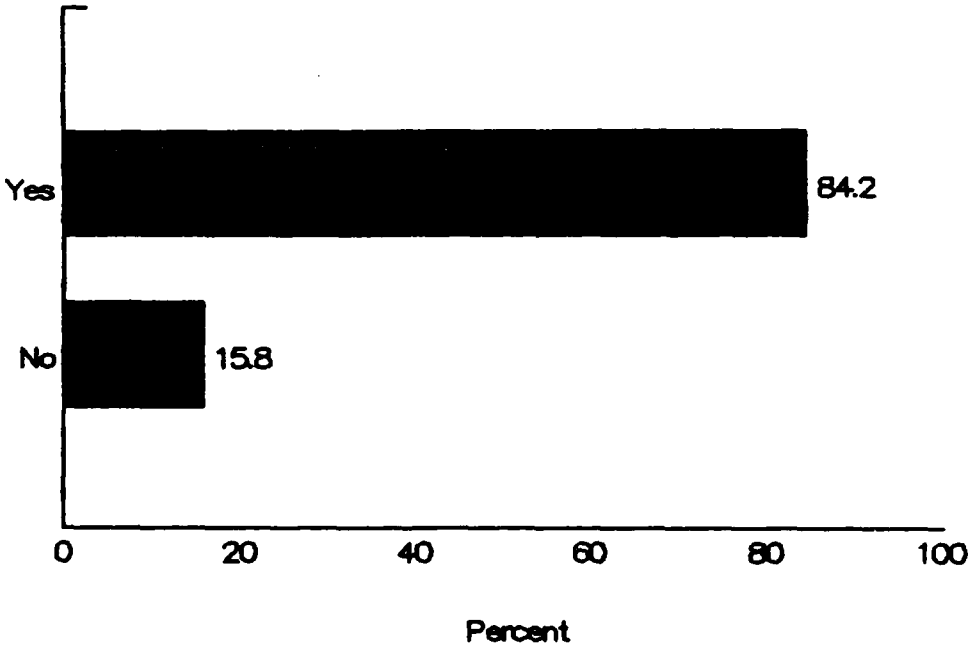


Figure 13. Responses to Question 13

Question 15 of the survey asked the respondents to choose the computer language that they were most familiar with. Responses to this question are depicted in Figure 14.

Most of the computer programs that are used for the courses at AFIT are application programs that do not require the user to know a computer language. These programs include word processors, spreadsheets, programs designed specifically for logistics problem solving. Other programs however--such

Which language are you most familiar with?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
FORTRAN	36	31.9	36	31.9
Pascal	6	5.3	42	37.2
BASIC	43	38.1	85	75.2
Other	6	5.3	91	80.5
None	22	19.5	113*	100.0

* There was one missing value.

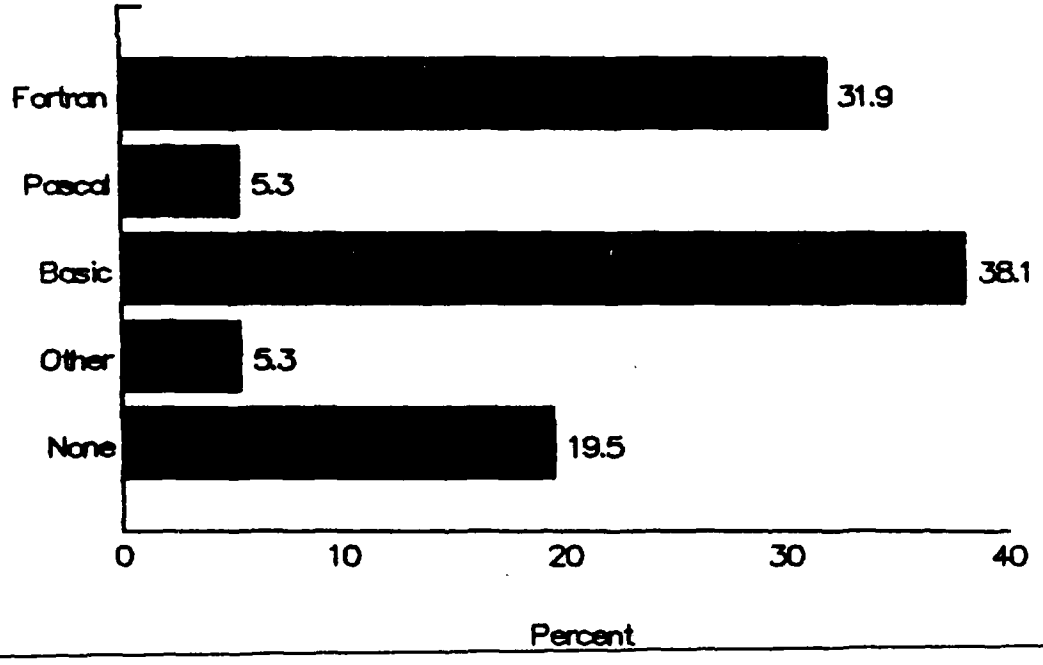


Figure 14. Responses to Question 15

as the mainframe statistical program SAS and certain forecasting programs--do require the user to perform some basic programming. For this reason, it was important to determine what percentage of the incoming student population knew a computer programming language, and if they did know a language, what language it was. As can be seen in Figure 14, four-fifths of the respondents are familiar with a computer language with FORTRAN and BASIC dominating the field. With the high percentage of the incoming students who are already familiar with a programming language, teaching them to use the programs that require this knowledge should not be difficult.

Questions 17 through 30 asked the respondents whether they were familiar with or whether they had used a particular family of computer programs such as word processors or spreadsheets. These questions were asked so that the faculty could determine if a particular family of computer programs would require more instructing than another.

Figure 15 displays the results of questions 20 and 21. As can be seen from the results, only a small percentage of the incoming class was unfamiliar with or had not used word processing programs. From these results, it would not appear unjustified for AFIT to refrain from teaching anything about word-processors. There should be ample help available to students that are unfamiliar with word-processors from the

program manuals that are supplied with the software, from books, or from other students that are more knowledgeable.

Are you familiar with word processing programs?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	107	93.9	107	93.9
No	7	6.1	114	100.0

Have you ever used a computer word processing program?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	103	90.4	103	90.4
No	11	9.6	114	100.0

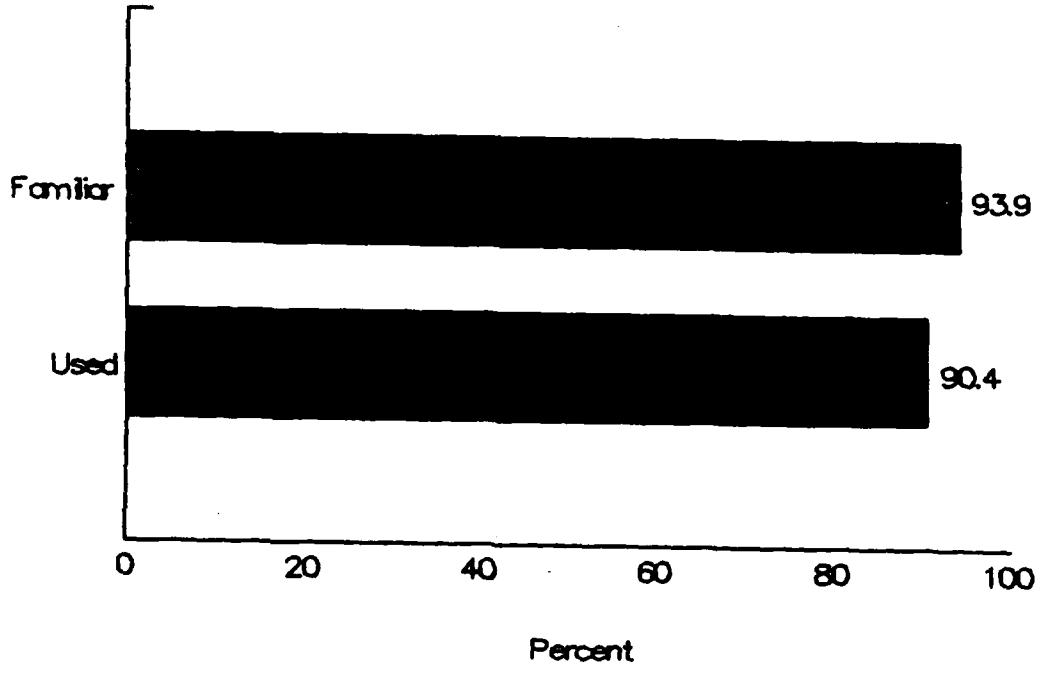


Figure 15. Responses to Questions 20 and 21

Questions 18 and 19 dealt with spreadsheet programs. Slightly more than half of the respondents were familiar with and had used spreadsheet programs as can be seen in Figure 16.

Are you familiar with computer spreadsheet programs?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	67	58.8	67	58.8
No	47	41.2	114	100.0

Have you ever used a computer spreadsheet program?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	60	52.6	60	52.6
No	54	47.4	114	100.0

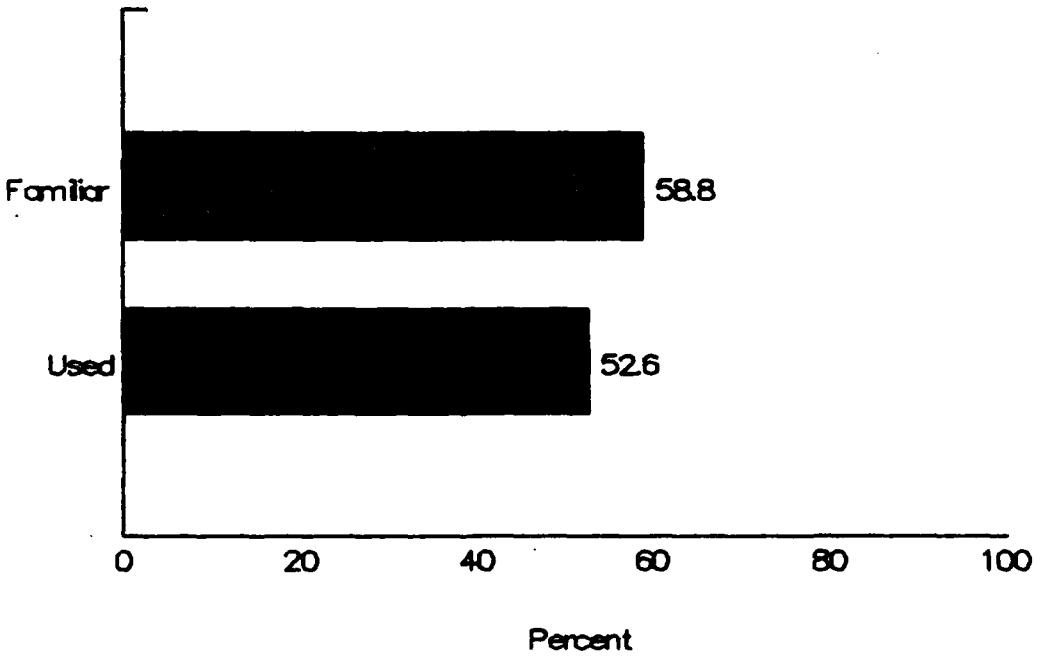


Figure 16. Responses to Questions 18 and 19

Questions 22 and 23 were about computer statistical programs. Through discussions with present students, it was clear that this was an area in which Class 88S/D was very weak. Figure 17 shows that Class 89S/D is also weak in this area. This area should receive faculty attention.

Are you familiar with computer statistical programs?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	31	27.2	31	27.2
No	83	72.8	114	100.0

Have you ever used a computer statistical program?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	22	19.3	22	19.3
No	92	80.7	114	100.0

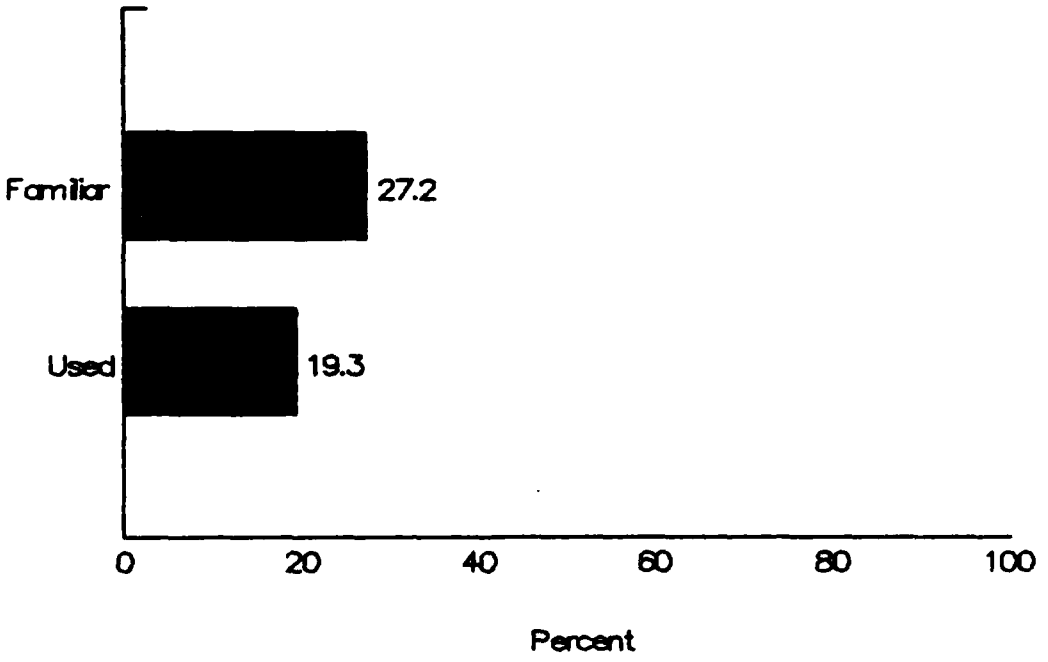


Figure 17. Responses to Questions 22 and 23

Questions 24 and 25 deal with modems and are depicted in Figure 18. AFIT has several Digital Equipment VAX computers

Are you familiar with what a modem is?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	109	95.6	109	95.6
No	5	4.4	114	100.0

Have you ever used a modem to access a 'bulletin board' or some other computer?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	45	39.5	45	39.5
No	69	60.5	114	100.0

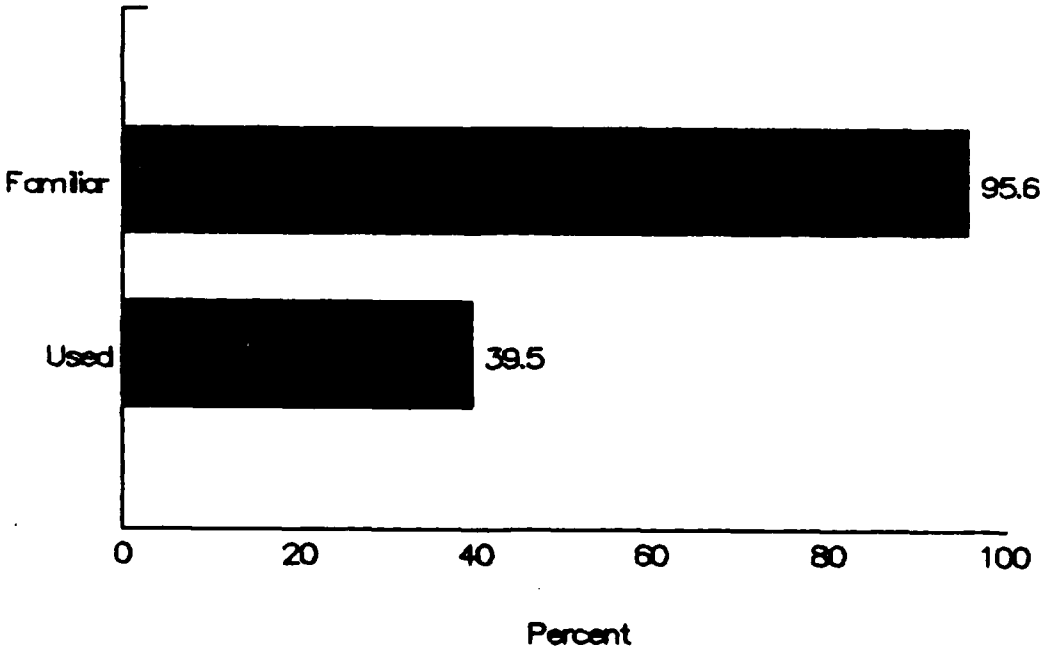


Figure 18. Responses to Questions 24 and 25

which are available for use by the students. The computers are part of a computer network that permits the exchange of information from student to student or from faculty to student through the use of the electronic mail or phone utilities. There are terminals available at the school which provide access to the VAX systems, but students often find it more convenient to work at home through the use of a modem.

Figure 18 shows that although a large majority of the respondents know what a modem is, just a little over a third had used one. Instructions on setting up a modem should be a requirement of all introductory computer courses at AFIT until the vast majority of students arrive with the knowledge of how to use a modem.

Question 26 also concerns the use of modems, but it is more specific because it deals with transferring files between computers. This capability is very useful when analyzing a particular set of data on both a PC and the VAX. It is much easier to transfer the data file from one computer to the other rather than typing in all the data twice. Other uses of this feature include down loading public domain computer programs from one of the many available bulletin boards. As can be seen in Figure 19 on the following page, about the same number of students that have used a modem (ref. Figure 18) have also transferred files with a modem.

Have you ever used a modem to transfer files or information between computers?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	42	36.8	42	36.8
No	72	63.2	114	100.0

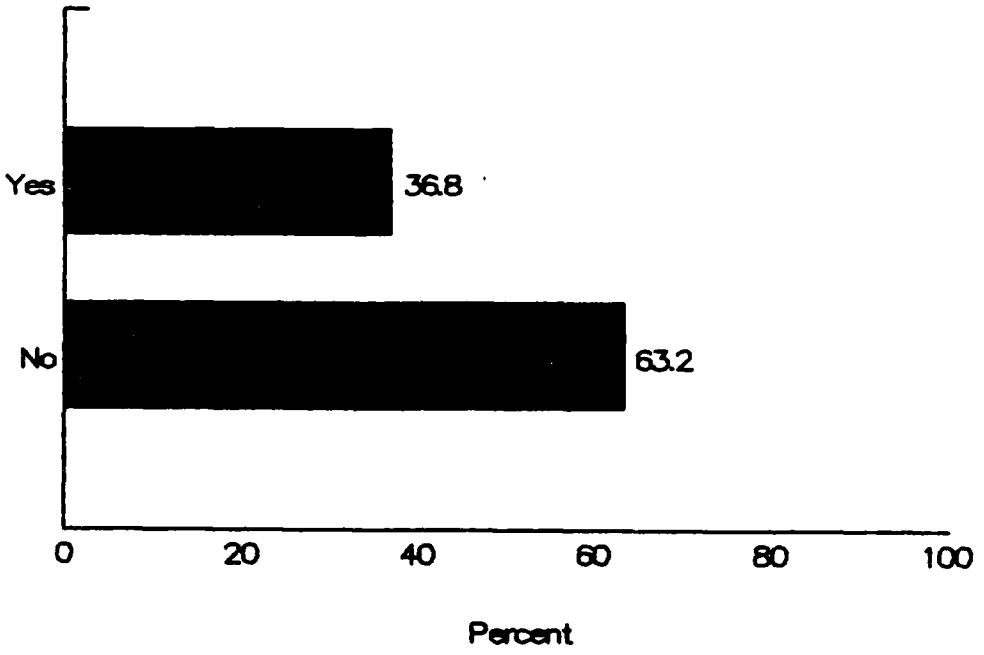


Figure 19. Responses to Question 26

The next area of interest concerned printing. From informal observations of students in the present class, it was noted that many of them experienced difficulties using the printers supplied by AFIT. Much of the problem was with not understanding how to use the software to format what they were trying to print so that it would print out correctly. Other problems were caused by a lack of understanding of how

to configure the printer to obtain the desired results and of how to put the printer on and off line.

Questions 27 and 28 of the survey concerned printing. The responses to these questions are in Figure 20. Question

Have you ever printed a document using a computer?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	110	96.5	110	96.5
No	4	3.5	114	100.0

Are you familiar with ASCII codes?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	45	39.5	45	39.5
No	69	60.5	114	100.0

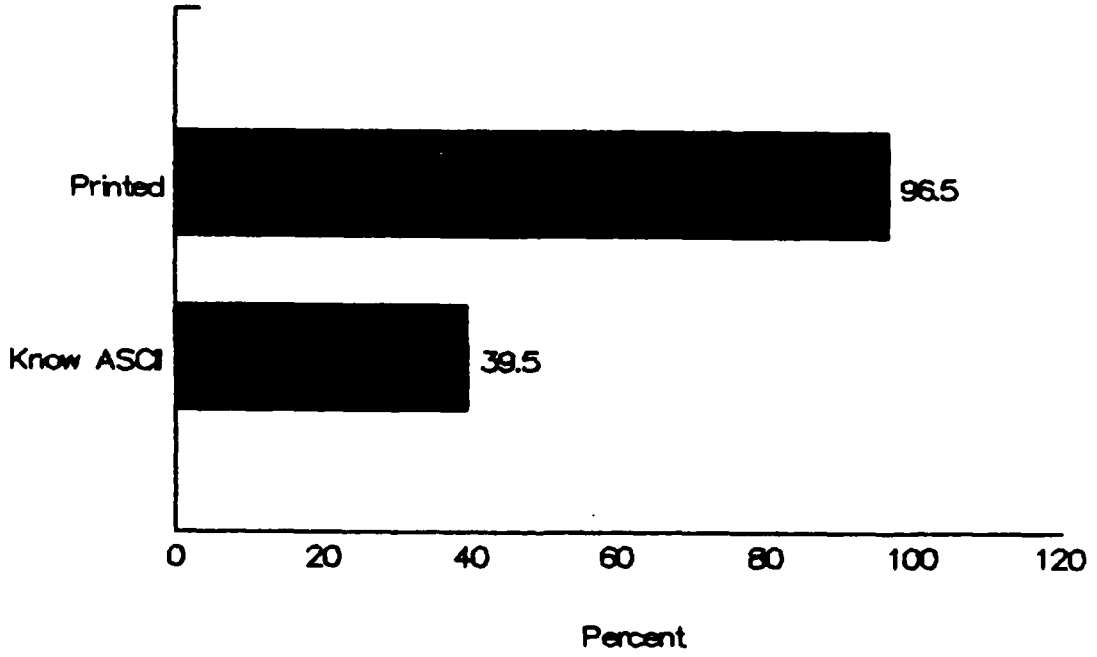


Figure 20. Responses to Questions 27 and 28

27 just asked if the respondent had ever printed a document. Question 28 inquired about the familiarity with ASCII codes. Although ASCII codes are not generally used in day to day computer applications, a knowledge of these codes and what they do is useful. With the great number of printers that are available on the market, it is impossible for software developers to design their software to work with all of them. Several software packages however do allow the user to design their own print drivers. This usually involves filling in blank spaces with ASCII codes found in the printer's reference manual. An understanding of ASCII codes makes this job of defining a printer to a software package much easier and permits the user to obtain the full benefits of both the printer and the software.

As stated above, AFIT's computers are linked through a network system that allows its users to send electronic mail, make 'phone calls' to other users, and transfer files between the computers. Questions 29 and 30 of the survey were asked to determine if the respondents were familiar with a computer network. Figure 21 shows that almost three fourths of the incoming students are familiar with computer networks, and a little less than half have used an electronic mail system.

Although a large portion of the incoming students are familiar with networks, specific instructions in the use of the mail and phone utilities and the procedures for transferring files should be taught during the introductory

course. The mail utility is especially important because several instructors use electronic mail for assigning work to their students.

Are you familiar with what a computer network is?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	82	71.9	82	71.9
No	32	28.1	114	100.0

Have you ever used a computer to send electronic mail?

Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	48	42.1	48	42.1
No	66	57.9	114	100.0

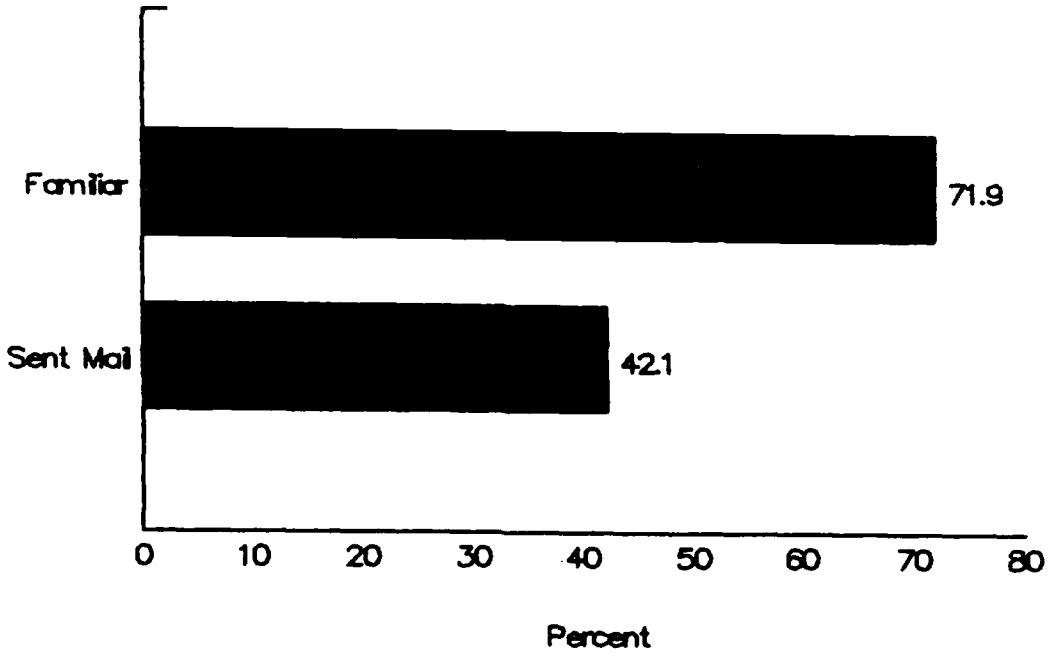


Figure 21. Responses to Questions 29 and 30

Questions 31 and 32 dealt with obtaining computer knowledge. Question 31 asked the respondents where their present skills were obtained, and question 32 asked the respondent to identify the method of instruction that they believe would work best for them. Because it was believed that the responses to these questions would be important for the development of future introductory computer courses, responses from both classes and the combined total are presented in Figures 22 and 23.

Figure 22 shows that the largest percentage in each group responded that they have gained their present knowledge from trial and error or from friends. The next largest was from formal education and then from reading computer material.

It is interesting to note how closely the responses provided by the two classes mirror each other. From looking at the results, it appears that the amount of formal computer education has not increased between the classes. It also appears that the students are obtaining their computer knowledge in approximately the same manner.

From Figure 23, it is evident that the majority of the respondents believe that small work-groups with an assistant would provide the best environment for learning computer skills. It is interesting to note that the least preferred method of learning was the method presently used by the largest percentage of the respondents; self study/trial and

Where did you learn most of your computer skills?

CLASS 88S/D Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Formal Ed.	32	30.2	32	30.2
Reading	27	25.5	59	55.7
Trial & Error	42	39.6	101	95.3
CAI	1	.9	102	96.2
Do not possess	4	3.8	106	100.0
CLASS89 S/D				
Formal Ed.	34	29.8	34	29.8
Reading	25	21.9	59	51.8
Trial & Error	47	41.2	106	93.0
CAI	3	2.6	109	95.6
Do not possess	5	4.4	114	100.0
COMBINED DATA				
Formal Ed.	66	30.0	66	30.0
Reading	52	23.6	118	53.6
Trial & Error	89	40.5	207	94.1
CAI	4	1.8	211	95.9
Do not possess	9	4.1	220	100.0

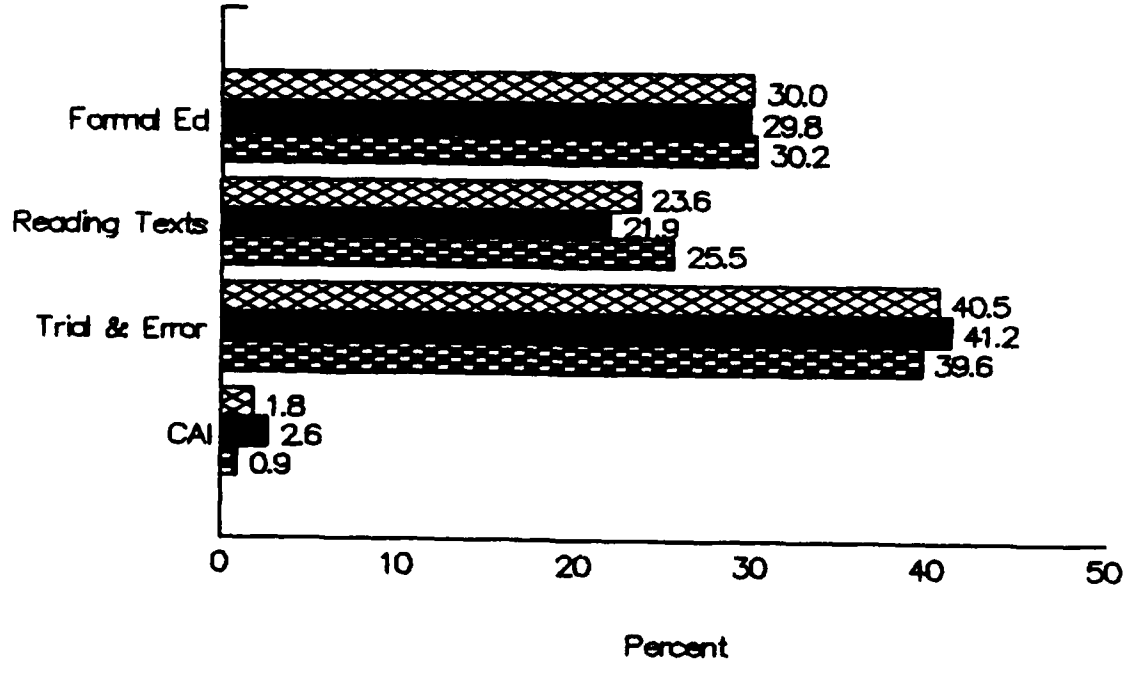


Figure 22 Responses to Question 31

Which method of learning do you believe would work best in teaching you computer skills?

CLASS 88S/D Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Formal Ed.	12	11.3	12	11.3
Self study	8	7.5	20	18.9
CAI	20	18.9	40	37.7
Work-group	66	62.3	106	100.0
CLASS 89S/D				
Formal Ed.	13	11.4	13	11.4
Self study	7	6.1	20	17.5
CAI	28	24.6	48	42.1
Work-group	66	57.9	114	100.0
COMBINED DATA				
Formal Ed.	25	11.4	25	11.4
Self study	15	6.8	40	18.2
CAI	48	21.8	88	40.0
Work-group	132	60.0	220	100.0

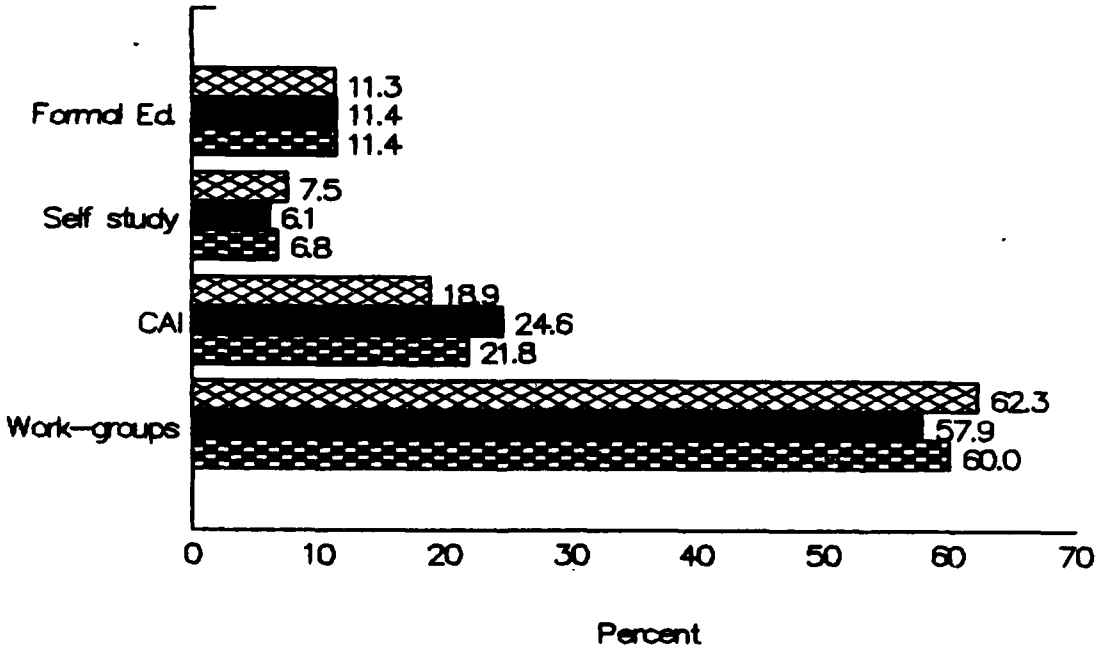


Figure 23. Responses to Question 32

error (ref. Figure 22). It is also interesting to note that the second most preferred method of instruction, computer aided instruction (CAI), accounted for the least amount of present knowledge (ref. Figure 22). These responses indicate that AFIT should consider restructuring their introductory computer courses to much more hands-on experience and possibly use CAI packages available from many software vendors.

The last demographic question to be presented in this section concerned the willingness of respondents to purchase a Zenith Z-248 computer if a zero interest finance program was available. There had been a consideration to offer such a deal, but the arrangements could not be worked out in time.

The favorable response by the students indicates that such a program should be considered for future classes. The higher response rate by Class 88S/D compared to Class 89S/D could be due to the fact that the former is presently using the Z-248 at AFIT. The results obtained from this question may be found in Figure 24.

Statistical Tests and Analysis

Five hypotheses were tested for this research. Details of each hypothesis test are presented in the following order: statistical test used, statement of the null hypothesis, the alternate hypothesis, the value of the test statistic, the observed significance level, whether the null hypothesis was

Would you be interested in obtaining a Zenith Z-248 computer if zero interest financing was available?

CLASS 88S/D Response	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Yes	74	71.2	74	71.2
No	30	28.8	104*	100.0

* There were two missing responses.

CLASS 89S/D				
Yes	72	63.2	72	62.2
No	42	36.8	114	100.0

COMBINED DATA				
Yes	146	67.0	146	70.0
No	72	33.0	218*	100.0

* There were two missing responses.

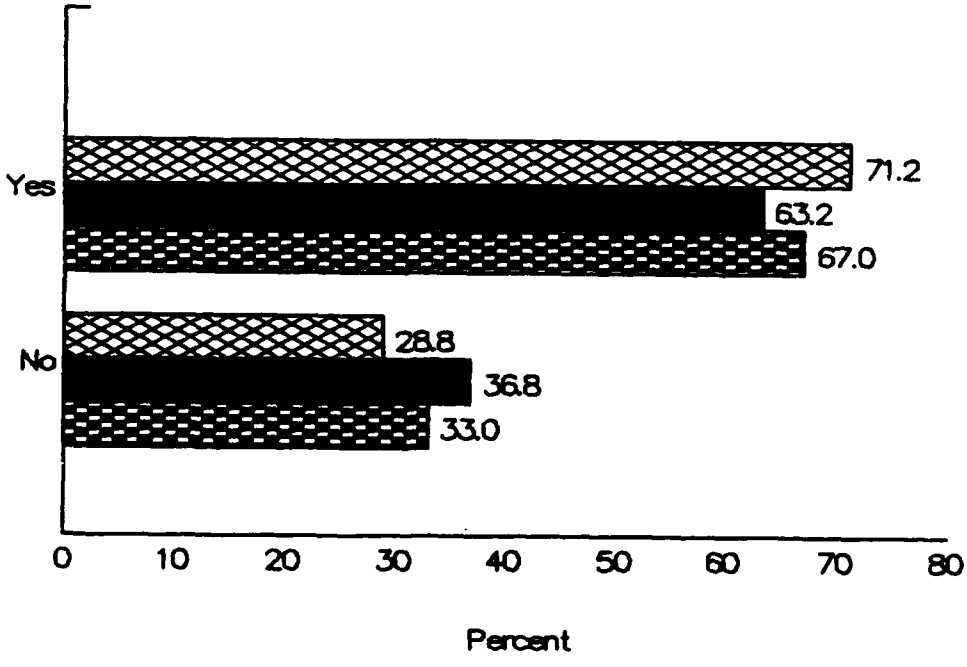


Figure 24. Responses to Question 34

rejected or not based on an alpha of 0.05, and then an analysis of the findings. The observed significance level is being presented, so the reader may decide if they would reject the null hypothesis.

> The observed significance level, or p-value, for a specific statistical test is the probability (assuming [the null hypothesis] was true) of observing a value of the test statistic that is at least as contradictory to the null hypothesis, and as supportive of the alternate hypothesis, as the one computed from the data. (11:298)

The worksheets that were used to determine the values of H_1, H_2, and H_3 test statistics may be found in Appendix C.

Hypothesis One. A test for correlation using the Spearman rank correlation coefficient was performed. The null hypothesis for H_1 was that there was no correlation between a student's level of computer knowledge and a student's college graduation date. The alternate hypothesis was that there was a correlation. The values of the test statistics and of the observed significance levels may be found in Table 1.

In eight of the nine correlations tested the results were the same, the null hypothesis could not be rejected. The only correlation that was significant at the 0.05 level was between the variables COLLEGE and VAXSCORE. For this reason H_1, which states that a student's level of computer knowledge is correlated with a student's college graduation date appears to be false if applied to MS-DOS hardware, but could be founded if applied to computers such as the VAX.

The lowest observed significance levels for each column are for the correlation between COLLEGE and VAXSCORE. A possible explanation for this could be the types of computer courses that were being taught in colleges and universities. It is possible that the schools were concentrating on mainframe computers and thus the significant test results. As the schools turn more to the use of PCs instead of mainframes, a stronger correlation should develop between the independent variable COLLEGE and the dependent variables MSCORE and TSTSCORE.

Table 1. Results of the Test for Correlation Performed for H_1

	COLLEGE		
	Class 88S/D	Class 89S/D	Combined
MSCORE	-0.00669 [1] 0.9457 [2]	0.02189 0.8188	0.06339 0.3516
VAXSCORE	0.16155 0.0980	0.11577 0.2241	0.14468 **0.0327**
TSTSCORE	0.01318 0.8934	-0.04038 0.6711	0.00651 0.9237

1. This is the value of the test statistic.
2. This is the observed significance level. All the tests were made using an alpha of 0.05.

Hypothesis Two. A test for correlation using the Spearman rank correlation coefficient was performed. The null hypothesis for H_2 was that there is no correlation between a student's level of computer knowledge and a

student's age. The alternate hypothesis was that there was a correlation. The values of the test statistics and of the observed significance levels may be found in Table 2.

In all nine of the correlations that were tested, the observed significance level was larger than alpha. Therefore the null hypothesis could not be rejected, and H_2, which states that a student's level of computer knowledge is correlated with the student's age, could not be accepted.

Table 2. Results of the Test for Correlation Performed for H_2

	BDATE		
	Class 88S/D	Class 89S/D	Combined
MSCORE	-0.07536 [1] 0.4493 [2]	0.15198 0.1113	0.08185 0.2331
VAXSCORE	0.03985 0.6894	0.10995 0.2507	0.07831 0.2541
TSTSCORE	-0.01713 0.8637	0.15164 0.1105	0.08208 0.2307

1. This is the value of the test statistic.
2. This is the observed significance level. All tests were made using an alpha of 0.05.

The main reason for testing H_1 and H_2 was to provide AFIT a means of predicting the computer skills of incoming students. The poor correlation that was attained in these tests make the variables COLLEGE and BDATE unsatisfactory predictors of a student's computer knowledge. At this point in the research, there was a doubt whether the variables that

were supposed to represent computer knowledge were really good indicators. In order to test the validity of the variables, another set of correlations was tested.

Survey questions 2 and 4 asked the respondents how long, expressed in months, they had been using a computer, and questions 9 and 11 asked how many hours per day the computer was used. The questions covered both the PC and mainframe computers. By making the assumption that the more a respondent uses a computer the more computer knowledge they should possess, it was possible to test the variables MSCORE, VAXSCORE, and TSTSCORE. Before TSTSCORE could be tested, it had to be divided into MSTEST and VAXTEST. This division was made, so time spent working with a PC would not be correlated against questions concerning the VAX and vice versa. If the variables were good indicators of knowledge, a high correlation should exist between the identified survey questions and the stated variables. The combined data set was used for these tests. The results of this set of tests are in Tables 3 and 4.

As can be seen from the tables, there is an almost perfect correlation between several of the questions and the variables. The higher of the observed significance levels were for correlations between questions dealing with PC use and VAX knowledge and between questions dealing with mainframe use and MS-DOS knowledge. These results lead to the conclusion that the questions asked in the survey did

Table 3. Results of the Test for Correlation Performed for Testing PC Survey Questions

	Question 2.	Question 9.
MSCORE	0.48893 [1] 0.0001 [2]	0.54439 0.0001
MSTEST	0.42032 0.0001	0.54541 0.0001
VAXSCORE	0.21372 0.0025	0.18395 0.0063

1. This is the value of the test statistic.
2. Observed significance level. All tests were performed using an alpha of 0.05.

Table 4. Results of the Test for Correlation Performed for Testing Mainframe Survey Questions

	Question 4.	Question 11.
VAXSCORE	0.30373 [1] 0.0001 [2]	0.19709 0.0034
VAXTEST	0.29584 0.0002	0.28136 0.0001
MSCORE	0.26861 0.0007	0.09391 0.1661

1. This is the value of the test statistic.
2. Observed significance level. All tests were performed using an alpha of 0.05.

obtain a measure of the respondent's computer knowledge and that there actually is no correlation between a respondent's college graduation date and computer knowledge or between a student's age and computer knowledge.

Hypothesis Three. The first test performed for H_3 was a chi-square test for independence, a contingency table analysis. The null hypothesis for this test was that the value of the sub-variables of MSCORE, VAXSCORE, and TSTSCORE are independent of the student's program option. The alternate hypothesis is that they are not independent. The values of the test statistic, X^2, and the observed significance levels may be found in Table 5. The reasoning behind performing three tests on each variable may be found in Chapter II under the subtopic 'Statistical Tests.'

The values of all the test statistics for all the sub-variables of MSCORE and TSTSCORE were below the critical chi-square value for 8 degrees of freedom, 15.51; therefore, the null hypothesis could not be rejected based on these two variables.

The values for the sub-variables of VAXSCORE are not as easy to interpret. The value obtained for the test between OPTION and HALF VALUE is smaller than the critical chi-square value of 15.51. However, 33 percent of the cells had expected counts of less than five because of the large number of very low scores attained by the respondents. Conover quotes Cochran as stating that, 'if more than 20% of the [expected values] are less than 5 the approximation [to a chi-square distribution] may be poor' (4:152). For that reason, the HALF VALUE sub-variable will not be considered. The X^2 values for the remaining portions of VAXSCORE were

larger than the critical chi-square value of 15.51, so the null hypothesis is rejected based on this variable.

The results of the chi-square test lead to the conclusion that the value of the MSCORE and TSTSCORE variables are not dependent on program option, but the value of the VAXSCORE variable is dependent on program option.

Table 5. Results of the Test for Independence Performed for Testing H_3

	OPTICN	
	X^2	Observed Sig Level
MSCORE		
Half Value	13.121	0.108
Mean	13.121	0.108
Median	10.010	0.264
VAXSCORE		
Half Value [1]	7.894	0.444
Mean	16.278	0.039 [2]
Median	17.052	0.030 [2]
TSTSCORE		
Half Value	10.095	0.258
Mean	11.686	0.166
Median	11.686	0.166

1. 33% of cells had expected values < 5.
2. Significant at alpha equal to 0.05.

The second test performed for H_3 was the median test. The null hypothesis for this test was that all the program options would have the same median. The alternate hypothesis was that at least two of the populations have different medians. The values of the test statistic, T, and the approximate observed significance levels may be found in

Table 6. The critical value of chi-square, based on 8 degrees of freedom, was 15.51.

Table 6 shows that the null hypothesis cannot be rejected based on the results of MSCORE and TSTSCORE, but that it could be rejected based on VAXSCORE. This leads to the conclusion that there is no difference in the median scores of the variables MSCORE and TSTSCORE based on different program options. There is however a difference in the median score for the variable VAXSCORE based on program option.

Table 6. Results of the Median Test Performed for Testing H_3

	OPTION	
	T	Observed Sig Level
MSCORE	10.010	> 0.25
VAXSCORE	17.052	< 0.05 [1]
TSTSCORE	11.686	< 0.25 & > 0.10
1. Significant at alpha equal to 0.05.		

Figure 25 is presented as a visual indication of how the program options compare to one another. The 'Y' axis represents correct answers. The blocks represent the mean number of correct responses for each group of questions. The figure shows that most of the program options obtained about the same scores. The GAL, GCA, and GSM options have the

PROGRAM OPTIONS

	GAL	GCA	GCM	GEM	GIM
MSCORE	10.50	11.08	7.89	7.27	7.38
VAXSCORE	2.77	2.25	2.89	2.26	1.46
TSTSCORE	2.68	3.5	2.26	2.02	1.62
COMBINED	15.95	16.83	13.04	11.55	10.46

	GIR	GLM	GSM	GTM	AVG
MSCORE	4.37	7.17	10.20	7.00	8.10
VAXSCORE	1.37	1.24	3.40	1.00	2.07
TSTSCORE	1.63	2.49	3.08	2.67	2.44
COMBINED	7.37	10.90	16.68	10.67	12.61

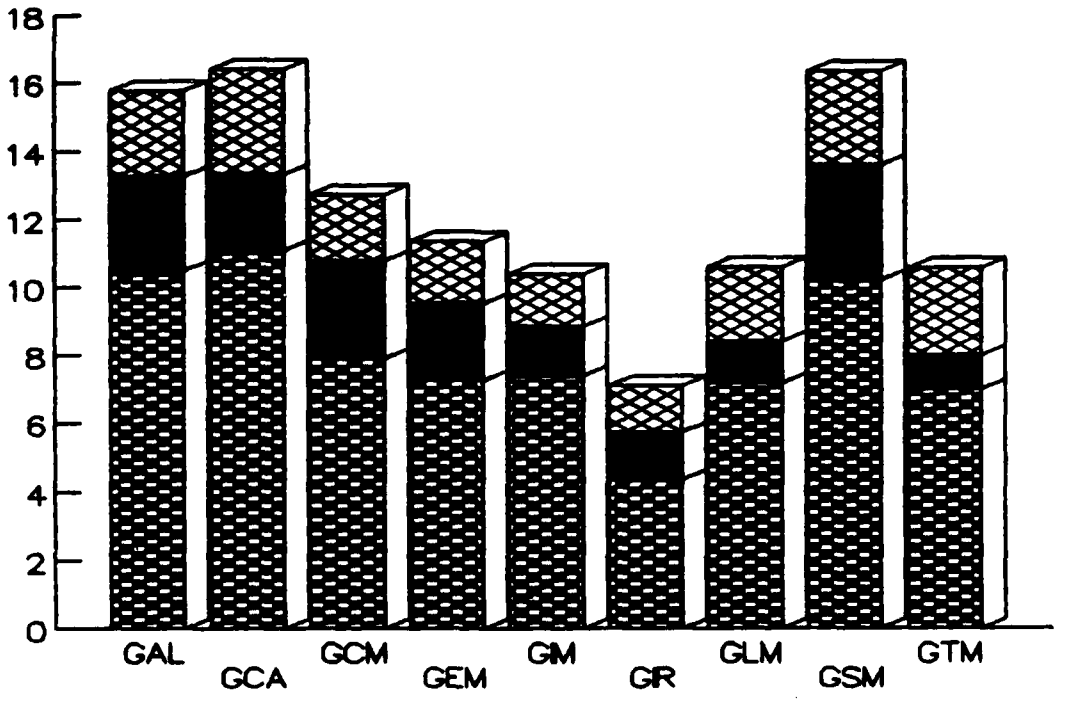


Figure 25. Comparison of Program Options
Tabulated Computer Knowledge

highest cumulative scores, and the GIR option has the lowest, but statistically, the only difference that can be stated is that at least two of the program options differ in the scores received for the variable VAXSCORE.

Hypothesis Four. The test used for H_4 was a test of an hypothesis about multinomial probabilities. The null hypothesis was that there is no preferred microcomputer for the incoming students' home environment. For the null hypothesis not to be rejected, the observed probability for each response alternative would have equaled approximately 0.333 since there were three choices. The alternate hypothesis was that there was a preferred system as evidenced by at least one of the observed probabilities being statistically different from 0.333.

The values for the test statistics and the observed significance levels may be found in Table 7. The X^2

Table 7. Results of the Preference Test Performed for H_4

	Class 88S/D	Class 89S/D	Combined
X^2	17.93	13.00	29.22
Table Chi-Square Value	5.99	5.99	5.99
Observed Sig Level	< 0.005	< 0.005	< 0.005

statistic for all three tests was greater than the table value of chi-square for two degrees of freedom and an alpha

of 0.05. Therefore, the null hypothesis is rejected, and the alternate hypothesis that there is a preferred system is accepted.

Although a test of a hypothesis of multinomial probabilities can only show that the selection probabilities are not equal, and not which one is preferred, from the data which are presented in Table 8; it is clear that MS-DOS machines do dominate the home environment of incoming AFIT students. This is the same result that Capt Luther obtained with the exception of the percentages. He found that only 39.3 percent of the students owned MS-DOS based machines and that a large percent, 39.08 percent, owned 'other' brands. The figure for Apple/Macintosh was about the same at 18.79 percent (9:137). The shift to the MS-DOS machines may have been caused by the lower prices of these machines now as compared to the 1986 time frame.

Table 8. Make of Computers Owned by Students

	Class 88S/D	Class 89S/D	Combined
MS-DOS	40[1] / 57.14[2]	33 / 53.22	73 / 55.30
Apple/Mac	16 / 22.86	10 / 16.13	26 / 19.70
Other	14 / 20.00	19 / 30.65	33 / 25.00

1. This is the number of this type computer owned.
2. Percent of total number of computers in column.

As stated in Chapter II, the fourth response, 'I do not own a personal computer', which was selected by 98 of the

respondents, was not included in the above tests because it did not constitute a computer preference. The large number that selected this response is significant for other reasons. Many of the students who marked this response may wish to purchase a computer after arriving at AFIT and may require assistance from the faculty. The faculty could be of great assistance to the incoming students if the professors were informed of the PC requirements of AFIT courses.

Hypothesis Five. The test used for H_5 was a test of an hypothesis about multinomial probabilities. The null hypothesis for H_5 was that there is no preferred computer system in the incoming students' work environment. For the null hypothesis not to have been rejected, the observed probability for each response alternative would have equaled approximately 0.25 since there were four choices. The alternate hypothesis was that there was a preferred system as evidenced by at least one of the observed probabilities being statistically different from 0.25.

The values for the test statistics and the observed significance levels may be found in Table 9. The X^2 statistic for all three tests was greater than the table value of chi-square for three degrees of freedom and an alpha of 0.05. Therefore, the null hypothesis is rejected, and the alternate hypothesis that there is a preferred computer system is accepted.

Table 9. Results of the Preference Test Performed for He

	Class 88S/D	Class 89S/D	Combined
X^2	69.49	107.04	171.98
Table Chi-Square Value	7.815	7.815	7.815
Observed Sig Level	< 0.005	< 0.005	< 0.005

Table 10 shows the types of computers that were used at work by the incoming students. Once again, it is clear that MS-DOS based machines dominated their environment.

Table 10. Make of Computers Used at Work

	Class 88S/D	Class 89S/D	Combined
Mainframe	32[1] / 31.68[2]	23 / 22.77	55 / 27.28
MS-DOS	56 / 55.45	68 / 67.33	124 / 61.39
Apple/Mac	1 / 1.0	0 / 0.0	1 / 0.5
Other	12 / 11.88	10 / 9.0	22 / 10.89

1. Number.
2. Percent of total computers in column.

IV. Conclusions and Recommendations

Significance of results

Little, if any, prior research has been accomplished in the area of discovering the computer skills which AFIT students arrive with. For this reason, there were very few known facts concerning this subject. This research was designed to broaden the factual base and, in doing so, to provide the faculty of AFIT with the knowledge that they require to advance the computer revolution that is occurring at AFIT.

One fact which was brought out in this research is that AFIT is not yet matriculating students with a strong formal background in the use of personal computers. Instead, the students appear to have more formal education in the use of mainframe computers. This is not meant to imply that they have more knowledge in the use of mainframes. As indicated by survey responses to questions that asked respondents to rank their PC and mainframe computer skills, students ranked their PC skills higher (see tables 36 and 37 in Appendix D). This is attributable to the fact that they use personal computers much more than mainframes.

At some point, students will arrive at AFIT with the ability to use a PC being as natural to them as the ability to use a hand-held calculator is to the present class. But, that point may be years away. According to several articles

requiring, or strongly suggesting, the use of PCs on their campuses within the last five years. Students who participated in this computer revolution are just now receiving their degrees. AFIT Class 88S/D has a mean college graduation date of 1980. Class 89S/D has a mean graduation date of 1982. If this two year jump per class were to continue, AFIT would have to look three classes into the future to expect to see significant numbers of students who were required to use PCs in obtaining their undergraduate degrees. AFIT must be prepared to instruct its students in computer basics till that time arrives.

Practical Implications of the Results

One of the hypotheses tested was that there was difference in the computer knowledge of AFIT students based on what program option they were in. The results of the hypothesis tests show that there is an apparent difference in the level of mainframe knowledge but not of PC knowledge. Since the bulk of the introductory computer courses concern the use of PCs, it would not appear to be advantageous to design introductory courses based on program options.

Tests of two hypotheses which dealt with determining if a particular computer dominated the computing environment of AFIT students, H_4 and H_5, provided predicable results. MS-DOS based computers dominate both the home and work environments of incoming AFIT students. The implication of these results is that AFIT should continue to base its

personal computer requirements around this system. When software is chosen for courses, it should be designed to run with an MS-DOS based machine.

There will always be arguments as to which make of computer is best. This research will not answer that question completely because different machines have their greatest attributes and limitations in different areas. And even if the question could be answered; it is not the question of interest here. The Department of Defense, of which the Air Force is a part, has chosen an MS-DOS based machine, the Zenith Z-248, as the basic personal computer.

The mission of AFIT "is to provide education to meet Air Force requirements in scientific, technological, managerial, medical, and other fields as directed by HQ USAF" (1:2). With the huge increase in the use of computers within the Air Force, part of this requirement is for AFIT to provide instruction in the use of computers. If AFIT is to provide that instruction in the short period of time when a student is present, they must follow the lead of other schools and standardize the computer requirements (13). Once a computer is selected, the faculty must use it and require the students to use it. One college requires its professors to assign a minimum of three assignments per term that require the use of a computer (13:192). Only with the full involvement of the AFIT faculty will the Air Force's requirement for computer literate graduates be met.

Two of the survey questions, questions 31 and 32, asked the respondents to indicate where they learned most of the computer skills that they possessed and asked them to chose the method of instruction that they believe would work best for them. The fact that most of the students stated that they learned how to use computers by the trial and error method, or from reading texts, echoes the lack of training in the Air Force discussed in Chapter I. The respondents' answers to the second question, which concerned how they would like to learn to use computers, may be a reason to change the method of instruction which AFIT uses.

AFIT is presently using a lecture/lab approach for the introductory computer courses. It was not well accepted by Class 88S/D, and from the unsolicited comments of Class 89S/D, the lecture/lab approach was not well accepted by them either. This could have been predicted because only a little over 11 percent chose a formal classroom setting as the preferred method of learning when responding to the survey. A vast majority of the students believe that a workgroup setting or computer aided instruction would be the preferred method of learning (see figure 32). AFIT may want to explore these avenues for the next class.

Recommendations for Follow-on or Revised Study

As discussed above, it may take years until the time AFIT is enrolling students who could be considered computer literate. Until such time, this research must continue

As discussed above, it may take years until the time AFIT is enrolling students who could be considered computer literate. Until such time, this research must continue because the information is required in order to provide the students the best education available and, in turn, the Air Force with the product that they expect.

This research laid the foundation for future research. It is by no means a perfect template that should be blindly accomplished each year. It should be improved and embellished each year until the knowledge level of incoming students makes its accomplishment unnecessary. An instruction sheet and list of recommended changes may be found in Appendix E.

Currently a research effort is underway at AFIT to determine what computer skills AFIT graduates are finding to be important. With the knowledge of what the students know before they get here, and a knowledge of what they should know when they leave, AFIT should be in the enviable position of knowing exactly what they must teach.

> **The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.** (12:40)

Appendix A: Survey Cover Letters And Survey Instrument

LS (Capt Lenz, AUTOVON 785-5435)

Computer Knowledge Survey Package

1. Please take the time to complete the attached questionnaire and return it and the answer sheet in the enclosed envelope by March 31, 1988.

2. This survey was designed to measure your knowledge of basic computer operations and to determine how much computer experience you have. The data gathered will become part of an AFIT research project and may influence the design of the introductory computer courses. Please do not refer to any reference material or ask anybody for assistance when answering the questions. I am interested in what you know off-hand. Your individual responses will be combined with others and will not be attributed to you personally.

3. Several of the questions make reference to MS-DOS PCs or the VAX. MS-DOS PCs are personal computers that run IBM software. The VAX refers to a Digital Equipment Corporation superminicomputer. It is not meant to infer that these computers are better than other brands or that they are endorsed; it is just that these are the computers that are used at AFIT/LS.

4. Your participation is completely voluntary, but I would certainly appreciate your help. For further information, contact Lt Col Peschke at AUTOVON 785-6280.

Richard E. Peschke, Lt.Col., USAF
Head, Department of Quantitative Management

2 Atch
1. Survey
2. Return Envelope

COMPUTER EXPERIENCE SURVEY

The survey that you are about to take was designed to determine how much computer experience incoming AFIT students possess. This information will be used to help determine the requirements of the computer course given during the short summer quarter and to determine if the level of computer experience is increasing from year to year.

I am requesting that you fill out the survey because part of my research will be to determine if there is a difference in the level of computer experience of our class and the incoming class. In order to make the comparison as fair as possible I need for you to do the following:

PLEASE ANSWER THE SURVEY BASED ON THE KNOWLEDGE THAT YOU POSSESSED WHEN YOU ARRIVED AT AFIT LAST YEAR, NOT ON THE KNOWLEDGE YOU NOW POSSESS! ALSO, PLEASE READ THE INSTRUCTIONS ON THE FIRST PAGE OF THE SURVEY!

Individual responses will be combined with others and will not be attributed to you personally. Your participation is completely voluntary, but I would certainly appreciate your help. If you have any questions or are interested in the results, please send me a note by E-Mail (RLENZ) or leave a note in my box. Thank you very much for your time and your help.

RICHARD C. LENZ, Capt, USAF

SURVEY FOR DETERMINING THE COMPUTER KNOWLEDGE OF PRESENT AND INBOUND AFIT STUDENTS

Instructions for filling out the answer sheet:

a. Please put your program option designator in the area marked 'LAST NAME' on the answer sheet and darken the corresponding circles. Examples of designator are: GLM, GAL, and GIR. If you do not know your program option, leave this blank.

b. Put the year you obtained your undergraduate degree in the last four columns of the block marked '123456' and darken the corresponding circles. (Right justify.)

c. Put your birth date in the block marked 'Birth Date' and darken the corresponding circles.

d. Please answer the questions by darkening the letter on the answer sheet that corresponds with your selection. Note that the answer sheet is built in columns of ten from left to right.

PLEASE READ THE INSTRUCTIONS BEFORE TAKING THE SURVEY!!!

NOTE: FOR THIS SURVEY, ANY COMPUTER LARGER THAN A PERSONAL COMPUTER IS CONSIDERED A MAINFRAME.

1. Have you ever used a personal computer?

   a. Yes b. No

2. How long have you been using a personal computer?

   a. 0 - < 6 months
   b. 6 - < 12 months
   c. 12 - < 24 months
   d. 24 months or greater
   e. do not use a personal computer

3. Have you ever used a mainframe computer?

   a. Yes b. No

4. How long have you been using a mainframe computer?

   a. 0 - < 6 months
   b. 6 - < 12 months
   c. 12 - < 24 months
   d. 24 months or greater
   e. do not use a mainframe computer

5. Do you own a personal computer?

   a. Yes b. No

6. What type of personal computer do you own? (If more than one, mark all that apply.)

   a. MS-DOS based PC
   b. Apple based (or Macintosh)
   c. Other
   d. I do not own a personal computer

7. Do you use a computer at work?

   a. Yes b. No

8. What type of computer do you use at work? (If more than one, mark all that apply.)

a. Mainframe
b. IBM PC or compatible
c. Apple based or compatible
d. Other based personal computer
e. I do not use a computer at work

9. How many hours a day on average do you use a personal computer? (Office and home time combined.)

a. 0 - < .5
b. .5 - < 1
c. 1 - < 2
d. 2 - < 4
e. 4 or more

10. The personal computer is primarily used for:

a. recreation (games)
b. educational purposes
c. work
d. home management (letters, budgets, etc.)
e. other/do not use

NOTE: YOU MUST START A NEW COLUMN WITH ANSWER # 11

11. How many hours a day on average do you use a mainframe computer? (In the office or from your home.)

a. 0 - < .5
b. .5 - < 1
c. 1 - < 2
d. 2 - < 4
e. 4 or more

12. The mainframe computer is primarily used for:

a. recreation (games)
b. educational purposes
c. work
d. home management (letters, budgets, etc.)
e. other/do not use

13. Have you ever had any formal instruction on the use of computers? (From college, AF, continuing education, etc.)

a. Yes b. No

14. Do you know, or have you ever known, a computer language such as fortran, pascal, or basic?

a. Yes b. No

15. Which language are you most familiar with?

a. FORTRAN
b. PASCAL
c. BASIC
d. Other
e. None

16. Were you required to take computer courses for your undergraduate degree?

a. Yes b. No

17. Were you required to own a computer at the institution from which you obtained your undergraduate degree?

a. Yes b. No

18. Are you familiar with computer spreadsheet programs?

a. Yes b. No

19. Have you ever used a computer spreadsheet program?

a. Yes b. No

20. Are you familiar with computer word processors?

a. Yes b. No

NOTE: YOU MUST START A NEW COLUMN WITH ANSWER # 21

21. Have you ever used a computer word processing program?

a. Yes b. No

22. Are you familiar with computer statistical programs?

a. Yes b. No

23. Have you ever used a computer statistical program?

a. Yes b. No

24. Are you familiar with what a modem is?

a. Yes b. No

25. Have you ever used a modem to access a 'bulletin board' or some other computer?

a. Yes b. No

26. Have you ever used a modem to transfer files or information between computers?

a. Yes b. No

27. Have you ever printed a document using a computer?

a. Yes b. No

28. Are you familiar with ASCII codes?

a. Yes b. No

29. Are you familiar with what a computer network is?

a. Yes b. No

30. Have you ever used a computer to send electronic mail?

a. Yes b. No

NOTE: YOU MUST START A NEW COLUMN WITH ANSWER # 31

31. Where did you learn most of the computer skills you presently possess?

a. From formal education
b. From reading texts such as instructions manuals
c. From trial and error or from friends
d. From computer aided instruction
e. I do not possess any computer skills

32. Which method of learning do you believe would work best in teaching you computer skills?

a. Formal education in a classroom setting
b. Self study/trial and error
c. Computer aided instruction (programed learning)
d. Small work-groups/labs with an assistant available to answer questions

33. How much are you willing to spend on a computer system?

a. $ 0
b. $ 1-1000
c. $ 1001-1500
d. $ 1501-2000
e. $ 2001+

34. If a zero interest finance program was available from the school, would you be interested in obtaining a Zenith 248 computer? (This is the computer the AF is currently buying.)

a. Yes b. No

THE NEXT SIX QUESTIONS SHOULD BE ANSWERED BASED ON THE FOLLOWING SCALE:

EXCELLENT	GOOD	ONLY FAIR	POOR	TERRIBLE
A	B	C	D	E

35. I would rate my overall skills in working with a personal computer as _____. (any PC)

36. I would rate my overall skills in working with an MS-DOS based personal computer as _____.

37. I would rate my overall skills in working with the VAX computer as _____.

38. I would rate my ability to use a computer word processing program as _____. (using any computer, any program)

39. I would rate my ability to use a computer spreadsheet program as _____. (using any computer, any program)

40. I would rate my ability to use a computer statistical program as _____. (using any computer, any program)

THE NEXT SEVENTEEN QUESTIONS REFER TO YOUR ABILITY TO USE AN MS-DOS BASED PERSONAL COMPUTER. WITHOUT HELP, COULD YOU PERFORM THE FOLLOWING TASKS?

A. = YES B. = NO

41. Format a disk _____
42. Make a system disk (used to boot a system) _____
43. Copy a disk _____
44. Copy a single file from a disk _____
45. Change from one disk drive to another _____
46. Change to a different sub-directory _____
47. Delete a file from a disk _____
48. Set up the computer _____
49. Set up a printer _____
50. Define a printer to a computer _____
51. Make a sub-directory _____
52. Delete a sub-directory _____
53. Boot the computer _____
54. Turn off the computer _____
55. Call up other computers using a modem or on a network _____
56. Transfer files between computers using a modem _____
57. Park a hard drive _____

THE NEXT ELEVEN QUESTIONS REFER TO YOUR ABILITY TO USE THE VAX COMPUTER. WITHOUT HELP, COULD YOU PERFORM THE FOLLOWING TASKS?

A. = YES B. = NO

58. Log on _____
59. Set a password _____
60. Edit a file using the built-in editor _____
61. Change directories _____
62. Copy a file from someone else's directory _____
63. Use the phone utility _____
64 Use the mail utility _____
65. Send a file to a printer _____
66. Down-load files to a PC _____
67. Up-load files from a PC _____
68. Log off _____

PLEASE ANSWER THE FOLLOWING QUESTIONS WITH NO HELP FROM BOOKS OR OTHER PEOPLE. THE PC QUESTIONS REFER TO AN MS-DOS MACHINE AND THE OTHER QUESTIONS REFER TO THE VAX. IF YOU KNOW THAT YOU DO NOT KNOW THE CORRECT ANSWER, PLEASE MARK ANSWER 'E' INSTEAD OF GUESSING.

69. While working in C: drive on a PC, to display the directory of a disk in the A: drive while remaining in the C: drive, you should type in:

a. A: DIR
b. DIR A:
c. List directory of A:
d. A: Display all
e. Do not know

70. To prepare a new disk for use on a PC, you need to use the command:

a. Prepare
b. Ready/disk
c. Format
d. There is no command
e. Do not know

71. A file that can be created to perform a desired set of start-up procedures and that is carried out automatically by DOS each time the system is started is:

a. Start.bat
b. Init.com
c. Autoexec.bat
d. Begin.bat
e. Do not know

72. You receive a 'phone call' while working on the VAX, to answer the call you:

a. type 'reply'
b. must be in the phone utility
c. type Ctrl-A
d. press the F2 key
e. Do not know

73. The command 'XMODEM' is used on the VAX to:

a. disconnect a line between computers
b. erase a file from a directory
c. to turn a modem off
d. transfer files between computers
e. Do not know

74. To restart your MS-DOS system in order to clear the memory, you should:

a. Press 'Ctrl-Alt-Del'
b. Press 'Ctrl-S'
c. Type start/over
d. Press the 'End' key
e. Do not know

75. A command that is used on the PC to print only what is shown on the screen is:

a. Print/screen
b. Scrn-pt
c. Ctrl-PrtSc
d. Shift-PrtSc
e. Do not know

Appendix B: SAS Program Description and SAS Files Used for This Research

Description of SAS Files

The statistical package used to analyze the data in this research was SAS which is a product of the SAS Institute Inc. 'The SAS System is a software system for data analysis' (17:2). The SAS files listed below were run on a Digital Equipment Corporation (DEC) VAX 11/785 superminicomputer operating the DEC VMS Operating System. The survey data was read into files on the VAX computer by the use of an optical scanner. The SAS files described in this appendix were used for this research.

In each program, the user's data file name should be substituted in the program after the statements 'data' and 'infile'. The input command takes the raw data from the data file and reads it into a SAS file. Names and letters have been used by this researcher for the variables. The numbers represent column numbers of where the information is in the original data file. **Make sure your data file has the correct information in the correct columns!** The slash between the '80' and the 'oo' tells the program to go to the next line; this is why your data file should be in two lines for each respondent.

There are some remarks in the programs as shown in the following pages. It is recommended these **are not** put in the

program you use. The program has not been run with them in place; they are just to help explain the program.

SAS Programs

DATA.SAS. This program should be run first in order to obtain a printout of the responses. This printout should be checked for missing data as evidenced by dots in place of numbers. If data are missing, check the answer sheet that corresponds to the 'NUMBER' variable on the printout. If the data is really missing, leave the dots in place. If the data is there but the optical scanner just did not pick it up, edit the file by deleting the dot and inserting the missing value. After the completion of this process you will have your working data file. Back it up several times!

FREQ.SAS. This program is used to obtain frequency tables of the data. It provides counts and percentages of each response.

H_BAR.SAS. This program is used to obtain horizontal bar charts of the data. Several options may be specified for the PROC CHART procedure that may be helpful in analyzing the data further. These options may be found in the publication SAS User's Guide: Basics (18:813-818).

CORR.SAS. This program is used to obtain Spearman rank correlation coefficients for testing hypotheses H_1 and H_2. The means and medians of MSCORE, VAXSCORE, and TESTSCORE are

also obtained with this program and these will be used for testing H_3 with the program OPTION.SAS.

OPTION.SAS. This program is used to obtain contingency tables for testing H_3. This program gives a 2 x 9 table as written. If enough data is available to use a larger table, without violating the requirements of a chi-square test, then the program will have to be reworked. This program must be run three times using the mean, median, and half values for each of the three variables MSCORE, VAXSCORE, and TSTSCORE. The mean and the median used in this program come from the program CORR.SAS. The half value is half the range of the each variable.

EASY.SAS. This program was used to obtain the mean and medians of MSCORE, VAXSCORE, and TSTSCORE for each program option. The results were used in a graph for H_3. This program must be run 9 times, varying the program options that are deleted to insure that each option is used in the correlation just once.

DATA.SAS

```
option ls=80;
data class89; /* Put in the name of your data file here */
infile class89;

input  option $1-3 college 23-26 bdate 29-30 number 37-40
a 41 b 42 c 43 d 44 e 45 f 46 g 47 h 48 i 49 j 50 k 51 l 52
m 53 n 54 o 55 p 56 q 57 r 58 s 59 t 60 u 61 v 62 w 63 x 64
y 65 z 66 aa 67 bb 68 cc 69 dd 70 ee 71 ff 72 gg 73 hh 74
ii 75 jj 76 kk 77 ll 78 mm 79 nn 80 / oo 41 pp 42 qq 43 rr 44
ss 45 tt 46 uu 47 vv 48 ww 49 xx 50 yy 51 zz 52 aaa 53 bbb 54
ccc 55 ddd 56 eee 57 fff 58 ggg 59 hhh 60 iii 61 jjj 62
kkk 63 lll 64 mmm 65 nnn 66 ooo 67 ppp 68 qqq 69  rrr 70
sss 71 ttt 72 uuu 73 vvv 74 www 75;

proc sort;
    by number; /* Sorts the data according to the survey number
*/;

proc print; /* Prints the results of proc sort */;
```

FREQ.SAS

```
option ls=80;
data class89;  /* Put the name of your data set here */;
infile class89;

input  option $1-3 college 23-26 bdate 29-30 number 37-40
a 41 b 42 c 43 d 44 e 45 f 46 g 47 h 48 i 49 j 50 k 51 l 52
m 53 n 54 o 55 p 56 q 57 r 58 s 59 t 60 u 61 v 62 w 63 x 64
y 65 z 66 aa 67 bb 68 cc 69 dd 70 ee 71 ff 72 gg 73 hh 74
ii 75 jj 76 kk 77 ll 78 mm 79 nn 80 / oo 41 pp 42 qq 43 rr 44
ss 45 tt 46 uu 47 vv 48 ww 49 xx 50 yy 51 zz 52 aaa 53 bbb 54
ccc 55 ddd 56 eee 57 fff 58 ggg 59 hhh 60 iii 61 jjj 62
kkk 63 lll 64 mmm 65 nnn 66 ooo 67 ppp 68 qqq 69 rrr 70
sss 71 ttt 72 uuu 73 vvv 74 www 75;

proc sort;
    by number;

proc print;
    title 'CLASS 89S/D';

proc freq; /* Provides frequency tables as output */;
```

H_BAR.SAS

```
data class89; /* Put the name of your data set here */;
infile class89;

input  option $1-3 college 23-26 bdate 29-30 number 37-40
a 41 b 42 c 43 d 44 e 45 f 46 g 47 h 48 i 49 j 50 k 51 l 52
m 53 n 54 o 55 p 56 q 57 r 58 s 59 t 60 u 61 v 62 w 63 x 64
y 65 z 66 aa 67 bb 68 cc 69 dd 70 ee 71 ff 72 gg 73 hh 74
ii 75 jj 76 kk 77 ll 78 mm 79 nn 80 / oo 41 pp 42 qq 43 rr 44
ss 45 tt 46 uu 47 vv 48 ww 49 xx 50 yy 51 zz 52 aaa 53 bbb 54
ccc 55 ddd 56 eee 57 fff 58 ggg 59 hhh 60 iii 61 jjj 62
kkk 63 lll 64 mmm 65 nnn 66 ooo 67 ppp 68 qqq 69 rrr 70
sss 71 ttt 72 uuu 73 vvv 74 www 75;

/* The next procedure generates charts */;

proc chart;
    hbar option / type = percent;
    hbar a / midpoints = 0 1;
    hbar b / midpoints = 0 1 2 3 4;
    hbar c / midpoints = 0 1;
    hbar d / midpoints = 0 1 2 3 4 ;
    hbar e / midpoints = 0 1;
    hbar f / midpoints = 0 1 2 3;
    hbar g / midpoints = 0 1;
    hbar h i j k l / midpoints = 0 1 2 3 4;
    hbar m n /midpoints = 0 1;
    hbar o / midpoints = 0 1 2 3 4;
    hbar p q r s t u v w x y z aa bb cc dd / midpoints = 0 1;
    hbar ee / midpoints = 0 1 2 3 4;
  hbar ff / midpoints = 0 1 2 3;
    hbar gg / midpoints = 0 1 2 3 4;
    hbar hh / midpoints = 0 1;
    hbar ii jj kk ll mm nn / midpoints = 0 1 2 3 4;
    hbar oo pp qq rr ss tt uu vv / midpoints = 0 1 2 3 4;
  hbar ww xx yy zz / midpoints = 0 1 2 3 4;
    hbar aaa bbb ccc ddd eee fff / midpoints = 0 1 2 3 4;
  hbar ggg hhh iii / midpoints = 0 1 2 3 4;
    hbar jjj kkk lll mmm nnn ooo ppp / midpoints = 0 1 2 3 4;
    hbar qqq rrr sss ttt uuu vvv www / midpoints = 0 1 2 3 4;
```

CORR.SAS

```
OPTION LS=80;
data combined;    /* Place the name of your data set here */
infile combined;

/* The next command was used to get the information from the
data set into a SAS data set. */;

input option #1-3 college 23-26 bdate 29-30 number 37-40 a 41
b 42 c 43 d 44 e 45 f 46 g 47 h 48 i 49 j 50 k 51 l 52 m 53
n 54 o 55 p 56 q 57 r 58 s 59 t 60 u 61 v 62 w 63 x 64 y 65
z 66 aa 67 bb 68 cc 69 dd 70 ee 71 ff 72 gg 73 hh 74 ii 75
jj 76 kk 77 ll 78 mm 79 nn 80 / oo 41 pp 42 qq 43 rr 44 ss 45
tt 46 uu 47 vv 48 ww 49 xx 50 yy 51 zz 52 aaa 53 bbb 54
ccc 55 ddd 56 eee 57 fff 58 ggg 59 hhh 60 iii 61 jjj 62
kkk 63 lll 64 mmm 65 nnn 66 ooo 67 ppp 68 qqq 69 rrr 70
sss 71 ttt 72 uuu 73 vvv 74 www 75;

/* The next seven lines were used to assign values to the
responses of questions 69-75. */;

IF QQQ=1 THEN QQQQ=1; ELSE QQQQ=0;
IF RRR=2 THEN RRRR=1; ELSE RRRR=0;
IF SSS=2 THEN SSSS=1; ELSE SSSS=0;
IF TTT=1 THEN TTTT=1; ELSE TTTT=0;
IF UUU=3 THEN UUUU=1; ELSE UUUU=0;
IF VVV=0 THEN VVVV=1; ELSE VVVV=0;
IF WWW=3 THEN WWWW=1; ELSE WWWW=0;

/* The next two lines essentially deleted the last response
to questions 6 & 8 by making them into missing values */;

IF b=4 THEN  b=.;
IF d=4 THEN  d=.;

/* The next line 'graded' questions 41-57. */;

MSCORE=17-(oo+pp+qq+rr+ss+tt+uu+vv+ww+xx+yy+zz+aaa+bbb+
ccc+ddd+eee);

/* The next line 'graded' questions 58-68. */;

VAXSCORE=11-(fff+ggg+hhh+iii+jjj+kkk+lll+mmm+nnn+ooo+ppp);

/* The next line 'graded' questions 69-75. */;

TSTSCORE=(QQQQ+RRRR+SSSS+TTTT+UUUU+VVVV+WWWW);
```

```
/* The next line 'graded' questions 69,70,71,74,and 75. */;

MSTEST=(QQQQ+RRRR+SSSS+VVVV+WWWW);

/* The next line 'graded' questions 72 and 73. */;

VAXTEST=(TTTT+UUUU);

/* The next procedure was used to test for correlation
between MS-DOS time and self ranking of the respondents to
scores */;

proc corr spearman;
    var b i ii jj;
    with MSCORE VAXSCORE MSTEST;

/* The next procedure tested for correlation between
Mainframe time and self ranking of the respondents to scores
*/;

proc corr spearman;
    var d k kk;
    with MSCORE VAXSCORE VAXTEST;

/*  The next procedure tested for correlation between COLLEGE
and SCORE variables and between BDATE and the SCORE variables
*/;

proc corr spearman;
    var COLLEGE BDATE;
    with MSCORE VAXSCORE TSTSCORE;

/*  The next procedure tested for correlation between COLLEGE
and listed variables and between BDATE and listed variables
*/;

proc corr spearman;
    var COLLEGE BDATE;
    with p n s u w jj;
```

OPTION.SAS

```
OPTION LS=80;
data combined;  /* Place your data file here */;
infile combined;

input  option $1-3 college 23-26 bdate 29-30 number 37-40
a 41 b 42 c 43 d 44 e 45 f 46 g 47 h 48 i 49 j 50 k 51 l 52
m 53 n 54 o 55 p 56 q 57 r 58 s 59 t 60 u 61 v 62 w 63 x 64
y 65 z 66 aa 67 bb 68 cc 69 dd 70 ee 71 ff 72 gg 73 hh 74
ii 75 jj 76 kk 77 ll 78 mm 79 nn 80 / oo 41 pp 42 qq 43 rr 44
ss 45 tt 46 uu 47 vv 48 ww 49 xx 50 yy 51 zz 52 aaa 53 bbb 54
ccc 55 ddd 56 eee 57 fff 58 ggg 59 hhh 60 iii 61 jjj 62
kkk 63 lll 64 mmm 65 nnn 66 ooo 67 ppp 68 qqq 69  rrr 70
sss 71 ttt 72 uuu 73 vvv 74 www 75;

IF QQQ=1 THEN QQQQ=1; ELSE QQQQ=0;
IF RRR=2 THEN RRRR=1; ELSE RRRR=0;
IF SSS=2 THEN SSSS=1; ELSE SSSS=0;
IF TTT=1 THEN TTTT=1; ELSE TTTT=0;
IF UUU=3 THEN UUUU=1; ELSE UUUU=0;
IF VVV=0 THEN VVVV=1; ELSE VVVV=0;
IF WWW=3 THEN WWWW=1; ELSE WWWW=0;

Mscore=17-(oo+pp+qq+rr+ss+tt+uu+vv+ww+xx+yy+zz+aaa+bbb+ccc+d-
dd+eee);

VAXscore=11-(fff+ggg+hhh+iii+jjj+kkk+lll+mmm+nnn+ooo+ppp);

TSTSCORE=(QQQQ+RRRR+SSSS+TTTT+UUUU+VVVV+WWWW);

MStest=(QQQQ+RRRR+SSSS+VVVV+WWWW);

VAXtest=(TTTT+UUUU);

IF MSCORE<=8 THEN MS=1;     /* These will be the mean, the */
IF MSCORE>8 THEN MS=2;      /* median, and half the value */
IF VAXSCORE<=5 THEN VX=1;
IF VAXSCORE>5 THEN VX=2;
IF TSTSCORE<=3 THEN TST=1;
IF TSTSCORE>3 THEN TST=2;

/* The next procedure is used to obtain contingency tables */

proc freq;
   Tables option*(MS VX TST) / chisq;
```

EASY.SAS

```
OPTION LS=80;
data combined; /* Put the name of your data set here */
infile combined;

input  option $1-3 college 23-26 bdate 29-30 number 37-40
a 41 b 42 c 43 d 44 e 45 f 46 g 47 h 48 i 49 j 50 k 51 l 52
m 53 n 54 o 55 p 56 q 57 r 58 s 59 t 60 u 61 v 62 w 63 x 64
y 65 z 66 aa 67 bb 68 cc 69 dd 70 ee 71 ff 72 gg 73 hh 74
ii 75 jj 76 kk 77 ll 78 mm 79 nn 80 / oo 41 pp 42 qq 43 rr 44
ss 45 tt 46 uu 47 vv 48 ww 49 xx 50 yy 51 zz 52 aaa 53 bbb 54
ccc 55 ddd 56 eee 57 fff 58 ggg 59 hhh 60 iii 61 jjj 62
kkk 63 lll 64 mmm 65 nnn 66 ooo 67 ppp 68 qqq 69 rrr 70
sss 71 ttt 72 uuu 73 vvv 74 www 75;

IF QQQ=1 THEN QQQQ=1; ELSE QQQQ=0;
IF RRR=2 THEN RRRR=1; ELSE RRRR=0;
IF SSS=2 THEN SSSS=1; ELSE SSSS=0;
IF TTT=1 THEN TTTT=1; ELSE TTTT=0;
IF UUU=3 THEN UUUU=1; ELSE UUUU=0;
IF VVV=0 THEN VVVV=1; ELSE VVVV=0;
IF WWW=3 THEN WWWW=1; ELSE WWWW=0;
IF B=4 THEN B=.;
IF D=4 THEN D=.;

IF OPTION='GAL' THEN A=1;     /* Asigns this nominal data a */
IF OPTION='GCA' THEN DELETE; /* numeracal value so that */
IF OPTION='GCM' THEN DELETE; /* proc corr will run */
IF OPTION='GEM' THEN DELETE;
IF OPTION='GIM' THEN DELETE;
IF OPTION='GIR' THEN DELETE;
IF OPTION='GLM' THEN DELETE;
IF OPTION='GSM' THEN DELETE;
IF OPTION='GTM' THEN DELETE;

MSCORE=17-(oo+pp+qq+rr+ss+tt+uu+vv+ww+xx+yy+zz+aaa+bbb+ccc+
          ddd+eee);
VAXSCORE=11-(fff+ggg+hhh+iii+jjj+kkk+lll+mmm+nnn+ooo+ppp);
TSTSCORE=(QQQQ+RRRR+SSSS+TTTT+UUUU+VVVV+WWWW);

proc corr;
    var A;
    with MSCORE VAXSCORE TSTSCORE;
```

Appendix C: Statistical Worksheets

H_3 Worksheet for the Median Test

TEST FOR MSCORE

MEDIAN	GAL	GCA	GCM	GEM	GIM	GIR	GLM	GSM	GTM	
> 9	13	4	8	14	5	4	24	24	4	100
<= 9	9	8	11	24	8	12	27	16	5	120
SUM	22	12	19	38	13	16	51	40	9	220

T = 10.010
Critical Chi-Square (df 8) = 15.51
Fail to reject null hypothesis.

TEST FOR VAXSCORE

MEDIAN	GAL	GCA	GCM	GEM	GIM	GIR	GLM	GSM	GTM	
> 0	10	6	8	18	3	3	13	23	2	86
<= 0	12	6	11	20	10	13	38	17	7	134
SUM	22	12	19	38	13	16	51	40	9	220

T = 17.052
Critical Chi-Square (df 8) = 15.51
Reject null hypothesis.

TEST FOR TESTSCORE

MEDIAN	GAL	GCA	GCM	GEM	GIM	GIR	GLM	GSM	GTM	
> 2	11	9	8	15	4	5	25	25	4	106
<= 2	11	3	11	23	9	11	26	15	5	114
SUM	22	12	19	38	13	16	51	40	9	220

T = 11.686
Critical Chi-Square (df 8) = 15.51
Fail to reject null hypothesis.

H_4 Worksheet

Class 88S/D

Computer Type	Number Owned (n)
MS-DOS	40
Apple/Macintosh	16
Other	14
Total	70
E(n) 70/3 =	23.333

$$X^2 = \Sigma [n - E(n)]^2/E(n)$$

$X^2 = 17.94$
Critical Chi-Square (df 2) = 5.99
Reject null hypothesis.

Class 89S/D

Computer Type	Number Owned
MS-DOS	33
Apple/Macintosh	10
Other	19
Total	62
E(n) 62/3 =	20.667

$$X^2 = \Sigma [n - E(n)]^2/E(n)$$

$X^2 = 13.00$
Critical Chi-Square (df 2) = 5.99
Reject null hypothesis.

Combined Data

Computer Type	Number Owned
MS-DOS	73
Apple/Macintosh	26
Other	33
Total	132
E(n) 132/3 =	44.000

$$X^2 = \Sigma [n - E(n)]^2/E(n)$$

$X^2 = 29.23$
Critical Chi-Square (df 2) = 5.99
Reject null hypothesis.

H_0 Worksheet

Class 88S/D

Computer Type	Number Owned (n)
Mainframe	32
MS-DOS	56
Apple/Macintosh	1
Other	12
Total	101
E(n) 101/4 =	25.250

$$X^2 = \Sigma [n - E(n)]^2/E(n)$$

$X^2 = 69.50$

Critical Chi-Square (df 3) = 7.82

Reject null hypothesis.

Class 89S/D

Computer Type	Number Owned
Mainframe	23
MS-DOS	68
Apple/Macintosh	0
Other	10
Total	101
E(n) 101/4 =	25.250

$$X^2 = \Sigma [n - E(n)]^2/E(n)$$

$X^2 = 107.04$

Critical Chi-Square (df 3) = 7.82

Reject null hypothesis.

Combined Data

Computer Type	Number Owned
Mainframe	55
MS-DOS	124
Apple/Macintosh	1
Other	22
Total	202
E(n) 202/4 =	50.50

$$X^2 = \Sigma [n - E(n)]^2/E(n)$$

$X^2 = 171.98$

Critical Chi-Square (df 2) = 7.82

Reject null hypothesis.

Appendix D: Frequency Tables for Class 89S/D

The following tables were produced with the computer statistical package SAS using the PROC FREQ command. The data set used was CLASS89. The numbers in the upper-left corner of the tables are the survey question numbers. Dots represent missing data. When the answer sheets were read by the optical scanner, numbers were assigned to each response as follows: A=0, B=1, C=2, D=3, E=4.

Questions 6 and 8 allowed for multiple answers and these were manually input into the data set. The following is the key to those questions:

Question 6.
- 5 = MS-DOS & Apple/Macintosh
- 6 = MS-DOS & Other

Question 8.
- 5 = MS-DOS & Mainframe
- 6 = MS-DOS & Other
- 7 = MS-DOS, Mainframe & Other
- 8 = Mainframe & Other
- 9 = MS-DOS, Mainframe, Apple/Macintosh & Other

OPTION	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
GAL	12	10.5	12	10.5
GCA	5	4.4	17	14.9
GCM	8	7.0	25	21.9
GEM	19	16.7	44	38.6
GIM	6	5.3	50	43.9
GIR	8	7.0	58	50.9
GLM	26	22.8	84	73.7
GSM	23	20.2	107	93.9
GTM	7	6.1	114	100.0

COLLEGE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
1974	1	0.9	1	0.9
1976	2	1.8	3	2.7
1977	5	4.4	8	7.1
1978	7	6.2	15	13.3
1979	6	5.3	21	18.6
1980	6	5.3	27	23.9
1981	10	8.8	37	32.7
1982	16	14.2	53	46.9
1983	20	17.7	73	64.6
1984	26	23.0	99	87.6
1985	13	11.5	112	99.1
1988	1	0.9	113	100.0

BDATE	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	2	.	.	.
20	1	0.9	1	0.9
48	1	0.9	2	1.8
49	2	1.8	4	3.6
50	2	1.8	6	5.4
51	4	3.6	10	8.9
52	1	0.9	11	9.8
53	1	0.9	12	10.7
54	8	7.1	20	17.9
55	4	3.6	24	21.4
56	7	6.3	31	27.7
57	12	10.7	43	38.4
58	9	8.0	52	46.4
59	7	6.3	59	52.7
60	10	8.9	69	61.6
61	24	21.4	93	83.0
62	11	9.8	104	92.9
63	8	7.1	112	100.0

1.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	101	88.6	101	88.6
1	13	11.4	114	100.0

2.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	24	21.1	24	21.1
1	13	11.4	37	32.5
2	13	11.4	50	43.9
3	52	45.6	102	89.5
4	12	10.5	114	100.0

3.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	77	67.5	77	67.5
1	37	32.5	114	100.0

4.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	30	26.3	30	26.3
1	10	8.8	40	35.1
2	11	9.6	51	44.7
3	21	18.4	72	63.2
4	42	36.8	114	100.0

5.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	59	51.8	59	51.8
1	55	48.2	114	100.0

6.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	30	26.3	30	26.3
1	9	7.9	39	34.2
2	17	14.9	56	49.1
3	55	48.2	111	97.4
5	1	0.9	112	98.2
6	2	1.8	114	100.0

7.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	84	73.7	84	73.7
1	30	26.3	114	100.0

8.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	7	6.1	7	6.1
1	52	45.6	59	51.8
3	7	6.1	66	57.9
4	29	25.4	95	83.3
5	14	12.3	109	95.6
6	2	1.8	111	97.4
7	1	0.9	112	98.2
8	1	0.9	113	99.1
9	1	0.9	114	100.0

9.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	53	46.5	53	46.5
1	28	24.6	81	71.1
2	20	17.5	101	88.6
3	10	8.8	111	97.4
4	3	2.6	114	100.0

10.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	8	7.1	8	7.1
1	7	6.2	15	13.3
2	60	53.1	75	66.4
3	19	16.8	94	83.2
4	19	16.8	113	100.0

11.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	101	88.6	101	88.6
1	9	7.9	110	96.5
2	2	1.8	112	98.2
3	2	1.8	114	100.0

12.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
1	4	3.5	4	3.5
2	42	36.8	46	40.4
4	68	59.6	114	100.0

13.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	96	84.2	96	84.2
1	18	15.8	114	100.0

14.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	90	78.9	90	78.9
1	23	20.2	113	99.1
4	1	0.9	114	100.0

15.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	36	31.9	36	31.9
1	6	5.3	42	37.2
2	43	38.1	85	75.2
3	6	5.3	91	80.5
4	22	19.5	113	100.0

16.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	78	68.4	78	68.4
1	36	31.6	114	100.0

17.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	1	0.9	1	0.9
1	113	99.1	114	100.0

18.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	67	58.8	67	58.8
1	47	41.2	114	100.0

19.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	60	52.6	60	52.6
1	54	47.4	114	100.0

20.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	107	93.9	107	93.9
1	7	6.1	114	100.0

21.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	103	90.4	103	90.4
1	11	9.6	114	100.0

22.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	31	27.2	31	27.2
1	83	72.8	114	100.0

23.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	22	19.3	22	19.3
1	92	80.7	114	100.0

24.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	109	95.6	109	95.6
1	5	4.4	114	100.0

25.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	45	39.5	45	39.5
1	69	60.5	114	100.0

26.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	42	36.8	42	36.8
1	72	63.2	114	100.0

27.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	110	96.5	110	96.5
1	4	3.5	114	100.0

28.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	45	39.5	45	39.5
1	69	60.5	114	100.0

29.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	82	71.9	82	71.9
1	32	28.1	114	100.0

30.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	48	42.1	48	42.1
1	66	57.9	114	100.0

31.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	34	29.8	34	29.8
1	25	21.9	59	51.8
2	47	41.2	106	93.0
3	3	2.6	109	95.6
4	5	4.4	114	100.0

32.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	13	11.4	13	11.4
1	7	6.1	20	17.5
2	28	24.6	48	42.1
3	66	57.9	114	100.0

33.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	8	7.0	8	7.0
1	24	21.1	32	28.1
2	46	40.4	78	68.4
3	19	16.7	97	85.1
4	17	14.9	114	100.0

34.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	72	63.2	72	63.2
1	42	36.8	114	100.0

35.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	10	8.8	10	8.8
1	29	25.4	39	34.2
2	44	38.6	83	72.8
3	18	15.8	101	88.6
4	13	11.4	114	100.0

36.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	6	5.3	6	5.3
1	33	28.9	39	34.2
2	28	24.6	67	58.8
3	27	23.7	94	82.5
4	20	17.5	114	100.0

37.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
1	7	6.2	7	6.2
2	15	13.3	22	19.5
3	35	31.0	57	50.4
4	56	49.6	113	100.0

38.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	21	18.4	21	18.4
1	42	36.8	63	55.3
2	29	25.4	92	80.7
3	14	12.3	106	93.0
4	8	7.0	114	100.0

39.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	7	6.1	7	6.1
1	24	21.1	31	27.2
2	26	22.8	57	50.0
3	25	21.9	82	71.9
4	32	28.1	114	100.0

40.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	2	.	.	.
0	5	4.5	5	4.5
1	6	5.4	11	9.8
2	15	13.4	26	23.2
3	33	29.5	59	52.7
4	53	47.3	112	100.0

41.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	68	59.6	68	59.6
1	46	40.4	114	100.0

42.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	43	37.7	43	37.7
1	71	62.3	114	100.0

43.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	75	65.8	75	65.8
1	39	34.2	114	100.0

44.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	77	67.5	77	67.5
1	37	32.5	114	100.0

45.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	79	69.3	79	69.3
1	35	30.7	114	100.0

46.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	61	53.5	61	53.5
1	53	46.5	114	100.0

47.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	79	69.3	79	69.3
1	35	30.7	114	100.0

48.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	66	57.9	66	57.9
1	48	42.1	114	100.0

49.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	64	56.1	64	56.1
1	50	43.9	114	100.0

50.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	42	36.8	42	36.8
1	72	63.2	114	100.0

51.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	40	35.4	40	35.4
1	73	64.6	113	100.0

52.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	39	34.5	39	34.5
1	74	65.5	113	100.0

53.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	81	71.7	81	71.7
1	32	28.3	113	100.0

54.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	95	84.1	95	84.1
1	18	15.9	113	100.0

55.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	33	28.9	33	28.9
1	81	71.1	114	100.0

56.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	28	24.6	28	24.6
1	86	75.4	114	100.0

57.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	30	26.3	30	26.3
1	84	73.7	114	100.0

58.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	42	37.2	42	37.2
1	71	62.8	113	100.0

59.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	30	26.5	30	26.5
1	83	73.5	113	100.0

60.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
.	1	.	.	.
0	28	24.8	28	24.8
1	85	75.2	113	100.0

61.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	22	19.3	22	19.3
1	92	80.7	114	100.0

62.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	16	14.0	16	14.0
1	98	86.0	114	100.0

63.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	11	9.6	11	9.6
1	103	90.4	114	100.0

64.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	18	15.8	18	15.8
1	96	84.2	114	100.0

65.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	32	28.1	32	28.1
1	82	71.9	114	100.0

66.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	8	7.0	8	7.0
1	106	93.0	114	100.0

67.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	7	6.1	7	6.1
1	107	93.9	114	100.0

68.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	42	36.8	42	36.8
1	72	63.2	114	100.0

69.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	29	25.4	29	25.4
1	42	36.8	71	62.3
4	43	37.7	114	100.0

70.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
2	75	65.8	75	65.8
3	1	0.9	76	66.7
4	38	33.3	114	100.0

71.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	1	0.9	1	0.9
1	1	0.9	2	1.8
2	53	46.5	55	48.2
4	59	51.8	114	100.0

72.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	1	0.9	1	0.9
1	3	2.6	4	3.5
2	1	0.9	5	4.4
4	109	95.6	114	100.0

73.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	2	1.8	2	1.8
2	1	0.9	3	2.6
3	9	7.9	12	10.5
4	102	89.5	114	100.0

74.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	61	53.5	61	53.5
1	2	1.8	63	55.3
4	51	44.7	114	100.0

75.	FREQUENCY	PERCENT	CUMULATIVE FREQUENCY	CUMULATIVE PERCENT
0	8	7.0	8	7.0
1	1	0.9	9	7.9
2	11	9.6	20	17.5
3	28	24.6	48	42.1
4	66	57.9	114	100.0

Appendix E: Raw Data

For a copy of the data, send a written request along with a blank, formated disk to:

AFIT/LSQ
Wright-Patterson AFB, OH 45433
ATTN: LtCol Richard E. Peschke

CLASS 88S/D DATA

```
GAL 19781056 8001021400031204114111100110010010232033424 4
GAL 19781056 8001000001011111001111111111111114244404
GAL 19760254 8002021402032004002011100110000010223024414 4
GAL 19760254 8002000001011111000011111111111114444444
GAL 19800457 8003021402031204141110100110110001234024414 4
GAL 19800457 8003000001000011001111111111111111244444
GAL 19800658 8004010000011202001010000110000000113022312 3
GAL 19800658 8004000000000000000000011110111012244 03
GAL 19801153 8005010300002022002111100001110110202022102 1
GAL 19801153 8005000001000111001110001110011002203 03
GAL 19830854 8006010301000002002011100110000000031023123 3
GAL 19830854 8006010001011011000110101110111042444444
GAL 19780151 8007030201094242103010000110000000121400100 2
GAL 19780151 8007000000000000000000000000000001221303
GAL 19760951 8008030305013212002010000110000000034012300 3
GAL 19760951 8008000000000000000001101000000012244 03
GAL 19791256 8009011400010204100011111110110100232144444 4
GAL 19791256 8009100111111111100111111111111111114444442
GAL 19770855 8010141413140404003011101111111111103114444 4
GAL 19770855 8010111111111111111111111111111111114444444
GCA 19770755 8011010313011204002111111110110001023011223 2
GCA 19770755 8011010000011101001110111111111104221402
GCA 19831060 8012030313053212000010000110000101123022300 2
GCA 19831060 8012000000000000000001101111111012213 43
GCA 19790956 8014030013010204014010100110110111023044424 4
GCA 19790956 8014111101100111001101111111111114444444
GCA 19830161 8015021400010204001010000000000111233022423 3
GCA 19830161 8015010001011111001111111111111111224404
GCA 19820160 8017020200033102001010000000000100134011311 2
GCA 19820160 8017000000000000000000011101110122402
GCA 19831260 8019030213012201002010000110000000114 113113
GCA 19831260 8019000000000000000001111111111111224303
GCA 19831061 8020010313050112000011100000110100023022113 2
GCA 19831061 8020010000011111001110000000011012414 04
GCM 19840651 8021100013000412002011100110110111033044424 4
GCM 19840651 8021111111111111110111111111111111114444444
GCM 19790547 8022020300013222002010000000010100114111320 2
GCM 19790547 8022000000000000000100100100011002214 02
GCM 19811258 8023000000051212004011100110110110232033433 4
GCM 19811258 8023111111111111111111111111111111114424404
```

```
GCM 19790356 80240214010103040100101001101101012341223133
GCM 19790356 80241111111111111011111111111111114444444
GCM 19830561 80250100010031010020100001011100102331343233
GCM 19830561 80251111111111111111101010110110444444O
GCM 19800557 80261414131004040040111111101111014320444444
GCM 19800557 80261111111111111111111111111111114444444
GCM 1975  53 80270302000531321021100000000000001320112012
GCM 1975  53 80270000000000000000000000000000221302
GCM 19830561 80280003131400110000111001101101010321344344
GCM 19830561 80281111111111111001111111111111114444344
GCM 19830756 80290000000502020000100111101100011311104414
GCM 19830756 80290000000000000000011111111111114224303
GCM 19830760 80300303000131040010111001100000000021112133
GCM 19830760 80300000000000000000000000010011002244O2
GCM 19750253 80310303000533220021100001101100002231223123
GCM 19750253 80310000010111111001110010110011012244O2
GEM 19750250 80320114001400041000111001101101114320334244
GEM 19750250 80320000010011110011111111111011112444444
GEM 19810155 80331010131404040020111111111111111O340344344
GEM 19810155 80331111111111111101111111111111114444444
GEM 19821254 80340000001401040000101001101100011241334244
GEM 19821254 80340000000001000000001101001110424440O2
GEM 19830961 80350010130102041000111011111101112310344344
GEM 19830961 80351111111111111101111111111111114444444
GEM 1983  60 80361010001404041141111111111111111114331444444
GEM 1983  60 80361111111111111111111111111111114444444
GEM 1979     80380201130112010000100001111101110330334324
GEM 1979     80381111111111111001111111111111114444444
GEM 19811156 80390310010103021000100001101101112331234114
GEM 19811156 80390100000000110011011111111111114444403
GEM 19820648 80400302050522220020111001101100012330002111
GEM 19820648 80400000010000110011111111111111111221303
GEM 19780151 80410314010132040020100001101101011340234214
GEM 19780151 80411100010101110011111111111111114444444
GEM 19831060 80420002020100040000111001101101012300342144
GEM 19831060 80420100010001110011101001101100422444O3
GEM 19830860 80430000001003021130111111111100111320334333
GEM 19830860 80430000010111110011111111111111110224444
GEM 19820553 80440102000002020030111001111100010230123222
GEM 19820553 80440100000001000011101100111111133333O3
GEM 19830560 80461400130004021000111001111101111220444244
GEM 19830560 80461111011111111011101111111111104444444
GEM 19780456 80470000011403010020100001111101110320344224
GEM 19780456 80471111111111111011111111111111114444444
GEM 19830360 80480000130004020000110001111101102300444234
GEM 19830360 80481111111111111101111111111111114444444
GEM 19840862 80490301130322040000100001100101111130223124
GEM 19840862 80490000000000110001111111111111111221303
GEM 19830861 80501000131404010020111111111111110331444444
GEM 19830861 80501111111111111101111111111111114444444
GEM 19790151 80510100130112010020111001100001012220234144
GEM 19790151 80510000000000000000110011101111224444
```

```
GEM 1983  54 80520000020300010020001001101101112320344234
GEM 1983  54 80521111111111111111100100110110124440O
GIM 19780556 80530303010122020021100001100100001340114014
GIM 19780556 80530000000000000000011111111111224403
GIM 19810854 80540103020010420021111001111101111120344244
GIM 19810854 80540100110001111011111111111114444444
GIM 19830661 80550114000100041001100001101100011320221244
GIM 19830661 80550000010000110011111111111110244400
GIM 19820359 80560303000512220000111001101101111330222133
GIM 19820359 80560100000001000011100000110110422140 3
GIM 19791054 80570103020813020141111001101101112300244244
GIM 19791054 80571111111111111111111111111114444444
GIM 19820259 80580000131304040001111111101101012330334344
GIM 19820259 80581111111111111111111111111114444444
GLM 19830560 80610002000501020O  1100000000000302111200l
GLM 19830560 80610000000001000001101111111101221302
GIM 1981     80620014020302040020111001100101112210224144
GIM 1981     80620000000001110011111111111114224400
GIR 19741052 80630100000132010001100000101101011330224104
GIR 19741052 80631111100101000011111111111110222303
GIR 19790258 80660102010100020121111001101101011310234244
GIR 19790258 80661111111111111111111111111114444444
GIR 19790657 80670200021400040020100001101101110320344224
GIR 19790657 80671111111111111111111111111114444444
GIR 19830660 80680100001401040111100001111101012330333223
GIR 19830660 80680000010000110011111111111111244403
GIR 19810659 80700300010101040020111000101101011341244233
GIR 19810659 80701111111111111111111111111114444444
GIR 19830257 80710014130102041141111001111101112330444344
GIR 19830257 80711111111111111011101011110110444444
GIR 19810557 80720303130132020031100000000000000000111011
GIR 19810557 80720000000000000000100000000110122230 3
GIR 19751153 80730001130004120021111001101001000341331133
GIR 19751153 80730100000000000011100000000110022130 3
GLM 19801054 80740000130112041141111001111101112010444244
GLM 19801054 80741111111111111101111111111111114444444
GLM 19780956 80750302020612040020111000000000001341004022
GLM 19780956 80750000000001000000000000000001221303
GLM 19840362 80760303020732021141111001111101111020114044
GLM 19840362 80760000010000110011111111111111110224300
GLM 19800558 80770014000122020121111001100001112320334234
GLM 19800558 80770100010001110011111111111111110224400
GLM 19750953 80790214130302041141111001111101112320334244
GLM 19750953 80791111111111111001111111111111114444444
GLM 19820253 80800000020000020021111011101100002321344444
GLM 19820253 80801111111111111111111111111111114444444
GLM 19800158 80811010131404041141111111101111004330444444
GLM 19800158 80811111111111111111111111111111114444444
GLM 19830659 80821402131404010000111110001101010220443441
GLM 19830659 80821111111111111011101110110110104444444
GLM 19820660 8083000 00140104013010000110110101033122432 4
GLM 19820660 80830000010001110011111111111111111244404
```

```
GLM 19790852 80840214011401041021100001101100111320134114
GLM 19790852 80841111111111111111111111111111114444444
GLM 1981  57 80860203020122010021111001101101112330243244
GLM 1981  57 80861111111111110011101111111111104444344
GLM 19830161 80871400131404040140111111101111110000333333
GLM 19830161 80871111111111111111111111111111110221302
GLM 19750651 80880300000102040020100001101100011311114014
GLM 19750651 80880000000000000011011111111111224403
GLM 19740251 80900303020520220031111001100100000010134244
GLM 19740251 80901111011111110001111111111111221403
GLM 19830961 80911003131404040000111110001101110330442443
GLM 19830961 80911111111111111011101111110111221303
GLM 1976  52 80920303020133220021100001100001002310134114
GLM 1976  52 80921111111111111111111111111114444444
GLM 19791057 80931400131404040140111111111111110341444444
GLM 19791057 80931111111111111011111111111114444444
GLM 19780856 80950002000004020020111011101101010331444444
GLM 19780856 80951111001011110011011111111114424404
GLM 1977     80960314001431040020100001101101011320113013
GLM 1977     80960000010000110011111111111114221303
GLM 19800157 80970314130112141141111001101101112230334144
GLM 19800157 80971111111111110011111111111111224303
GLM 19771252 80980003001400040020111001101110010221113033
GLM 19771252 80980000000000000011111111111111224403
GLM 19800858 81000103010523120000111000001100012141123021
GLM 19800858 81000000000111100011101111111104444404
GLM 19791156 81010203131402020001111111101111110030334344
GLM 19791156 81011111111111111101111111111114444444
GLM 19760853 81021414131404040021111001100100110340444244
GLM 19760853 81021111111111110011111111111114444444
GSM 19820756 81030301000111020020100000000000002020213123
GSM 19820756 81030000000000000000100100000000221302
GSM 19800658 81040101000222020000111001101101110320324223
GSM 19800658 81040000010001110011101111111111244404
GSM 19830960 81060301130122020000100001101100002340223134
GSM 19830960 81060000000011000011111111111114224304
GSM 19781056 81070000011400040020111101101101111201344344
GSM 19781056 81071111111111111111111111111114444444
GSM 19831260 81100302130504320020101001101100012120101012
GSM 19831260 81100000000000000000100000000000224303
GSM 19711248 81110303000142120000100001100101011331112012
GSM 19711248 81110000000000000011011111111111224303
GSM 19840662 81130303000112020030100000000000000040113112
GSM 19840662 81130000000000000001000001100001224303
GSM 19831261 81140000000102020000111001101101112021334244
GSM 19831261 81140000010111110011111111111110244444
GSM 19820957 81170303000520020000100000100000002341001112
GSM 19820957 81170000000000000000000000000001221303
GSM 19791256 81181403130004120020111011101101012220333333
GSM 19791256 81181111111111111101111111111114444444
GSM 19830761 81210300130102010000110001100001002220334344
GSM 19830761 81211110010111111011101111001100444444
```

```
GSM 19830961 81220203130512020000110001111101002320444244
GSM 19830961 81221111111111110011011111111111114444444
GSM 19830261 81241403130004220010111111111101110220442444
GSM 19830261 81241111111111111011100001110110444444
GSM 19800656 81250002000101021140100001111111112330334334
GSM 19800656 8125001101111100001101111111111110224402
GSM 19810758 81280214130102040000111001111101112210334233
GSM 19810758 81281111011111110011101111111111104444444
GSM 19800758 81300303010122120000100000000000010331112111
GSM 19800758 81300100000001110011111111111111110223442
GSM 19831061 81310001000011020000100111101111110121223314
GSM 19831061 8131000101111111000010111111111100224402
GTM 19750253 81330314000101040 20111001101101112320334244
GTM 19750253 81330000010001110011111111111111114224403
GTM 19830861 81340100000131010021100000000100002320114003
GTM 19830861 81340000000000110001101111101101224403
```

CLASS 89S/D DATA

```
GAL 19840162 91520303130502020000111001100001010220111111
GAL 19840162 91521100000000110000100000110000424404 4
GEM 1985  63 91470001020023320000100001100001002211244014
GEM 1985  63 91471111111111111111111111111111114244444
GCM 19781054 91460001010103021141111001101101112230233233
GCM 19781054 91461111111101111001111111111111110244404
GSM 19831061 91440214130102040001111001101101112340334344
GSM 19831061 91440111001111110011111111111111110444444
GAL 19850758 91430114021400040000100111101101112310233323
GAL 19850758 91431111111111111011100011111110444444 4
GIR 19761054 91411403130004220020111001101101112340333011
GIR 19761054 91411111111111111111111111111111114444444
GCA 19820758 91400200020302020030100000001101000000224122
GCA 19820758 91400000000111110011111111111111111204400
GSM 19821158 91320200000102040140110001101001012330224233
GSM 19821158 91320100000111110011101000110000024444 4
GSM 19830661 91310303130522020030100001100001001330112024
GSM 19830661 91310000000000000000000011000000 1221304
GSM 19810559 91300300130142020020100000101101011340113023
GSM 19810559 91300000000000000011011111111111111224403
GSM 19810359 91290303000123020000100000100000010320111122
GSM 19810359 91290000000000000000000111111110 1224403
GEM 19850561 91280110130112040001111001101100002320344344
GEM 19850561 91281111111111111101111111111111114444444
GIR 19740949 91270003021403040141111001100001002311344344
GIR 19740949 91271111111111111111111111111111114444444
GLM 19840961 91230302130512020020100001100000000330223114
GLM 19840961 91230100000100110000100000110110 1224402
GLM 19850560 91210303020511020120101001100001010210233123
GLM 19850560 91211111111111111011111111111111114444444
```

```
GIM 19801057 911900001301120200001010011011010123213342 44
GIM 19801057 911901000101111110111111111111111142444 44
GAL 19830161 911803031301220200001000011001010120012232 04
GAL 19830161 911800000000000000010111111111111224403
GLM 1982  51 911701020000101200201100011011011130202241 34
GLM 1982  51 91170000010111110011101100110110422440 2
GAL 19840762 911600040114030414011110011111101112331234 144
GAL 19840762 91161111100001110011101111110110444444 4
GTM 19851063 911500011314040400001110000011011100202232 32
GTM 19851063 911511111111111111111111111111111142444444
GIR 19850263 911401101300020200201111111111011023102442 33
GIR 19850263 911411111111111111111111111111111142444444
GLM 19840660 911203100601110200201010011011011112211240 33
GLM 19840660 911200000000001100111111111111111142444444
GCM 19771051 911314141314040401411110111111111110301444 444
GCM 19771051 911311111111111110111111111111111142444444
GEM 19801157 911000011301020100001110000011011103114443 33
GEM 19801157 911000000111111110111111111111111244444
GIM 19840261 910814001314040400001111111011010102203333 33
GIM 19840261 910811111111001111011111111111111142444444
GIM 19770855 910700140001230400311000011011011103112232 23
GIM 19770855 910700011100001100111111111111111224401
GSM 19830159 910603140001120400001110011011000113202141 44
GSM 19830159 910600000100001100111111111111114224403
GSM 19840261 910501000001321200201000011000000023111130 23
GSM 19840261 910500000001110000000111111111111224303
GSM 1984      910403031301120400001000011011000003301121 23
GSM 1984      91040100000000110011000001100110122440 4
GCM 19830357 910303020001100200001000011010000012211131 14
GCM 19830357 910300000000000000111111111111110224400
GEM 19801257 910203020001130400001000011001000021411130 23
GEM 19801257 910200000000000000110000000001101224403
GSM 19830461 910003141303120400001000011000010000111131 13
GSM 19830461 910001000000011100000000111111101224442
GCM 19840861 909901040014030400201100011000001003201120 14
GCM 19840861 909900000000000000001111111111111244404
GLM 19821154 909814141314040411411110011011011120204443 44
GLM 19821154 909811111111111111111111111111111142444444
GEM 19820360 909601101303120400001110011111011023202332 22
GEM 19820360 909611111111111111111100111111110424444 4
GIR 19850261 909510141314030411411110011011011142204443 44
GIR 19850261 909511101101011101111111111111111142444444
GIR 19780952 909414141314040411411110001011111142304444 44
GIR 19780952 909411111111111111111111111111111142444444
GEM 19780855 909102000001120400201010000000000112412231 32
GEM 19780855 909100000000000000100010001100100224400
GLM 19840520 908703141314000400211110011000010003213341 44
GLM 19840520 908711111111111111111111111111111142444444
GIM 19830661 908802100101030200101000000000010003402232 22
GIM 19830661 908800000060111100001111111111110244444
GTM 19840857 908603010005130200001000011011000013301121 34
GTM 19840857 908600000000000000110011001001101224403
```

```
GLM 19840161 908503141301220410211000011011010113101141l4
GLM 19840161 90850100000000000011111111111111224403
GLM 19770850 90830414131404040141111101101100014331444444
GLM 19770850 90831111111111111111111111111111114444444
GCA 19790957 90820303130122040120100000000001012320224222
GCA 19790957 90820100010111110000100011100110024440 4
GSM 19820160 90810300000520020000100001100101001321212123
GSM 19820160 90810000000000110001001011100110122440 3
GIR 19850263 90801001131404041141111001101101112010444344
GIR 19850263 90801111111111111111111111111111114444444
GSM 19840462 90790304130102040000110001100001002301224234
GSM 19840462 90790100010001110001111111111111110224404
GLM 19810254 90780314000602040140111000101101012330334244
GLM 19810254 90780100010001110011011111111111111224403
GAL 19840862 90760303130532020000101000100000002301223244
GAL 19840862 90760100000111000000100101000000022030 2
GLM 19830554 90750314010132040011100001101100011231124013
GLM 19830554 90751110011001110011111111111111110444304
GIR 19820360 90740000020100010021100001101101011010234244
GIR 19820360 90740100000011000011011111111111110224403
GLM 19840562 90700302130732120020100000000001002210113112
GLM 19840562 90700000000000000000011111111111111224403
GAL 19820651 90730203000521020020100000100000013340114133
GAL 19820651 90730100000000000011000111111111012244 3
GEM 19850255 90690103010011020020100000001100010241123111
GEM 19850255 90690101110000110011100111111111042444 4
GSM 19821060 90670101130812120020100001100001001300113112
GSM 19821060 9067000101011111001111111111111110214404
GCM 19830261 90660014130302041141111001100000002310332344
GCM 19830261 90661111110111110011100001100110142444 0
GSM 19810259 90640303000522120020101000100000002330011033
GSM 19810259 90640000000000000001000111100110122440 2
GAL 19781156 90620304010121041141100001100001011341111 02
GAL 19781156 90620000000000000000011111111111110224404
GSM 90610314130102040021111001101000010020224144
GSM 90610110010001110011101101110110424444 4
GSM 19880956 90590104130112040020111001101101013230234244
GSM 19880956 90591110000001110011111111111111114444444
GIM 19840961 90581400131404020020011111101101010310332224
GIM 19840961 90581111111101111101110001111011044444 44
GEM 19851163 90560302000522120020100000000000001321001001
GEM 19851163 90560000000000000000000000000000000224202
GIR 19801058 90540014000301040000111001101101112120444244
GIR 19801058 90541111111000110011011111111111114444404
GEM 19830461 90530302010932020020100000001100002310113122
GEM 19830461 90530000000001 11011111111111110224303
GLM 19781156 90510214130132041141100001100000002330223223
GLM 19781156 90510000000000000001111111111111111224403
GSM 19840262 90500303000532120000100001100000000341101113
GSM 19840262 90500000000000000000000000000000001221303
GCA 19780557 90470303011402040000100000000000002321112000
GCA 19780557 90470100010001110011111101111011111224404
```

```
GLM 19820651 904602140201120400201000011000000122202241 23
GLM 19820651 90460100000000000011111111111111102244 03
GTM 19850563 90450014130102040020111010100001002320434444
GTM 19850563 90451111001111111000111111111111114244444
GIM 19840361 90430002131404040000111000000100010320233131
GIM 19840361 90431100010111110011100010010110444444 4
GSM 19811158 90420203130522120030111001101100002320112133
GSM 19811158 90420100000000110011100001100110024440 4
GLM 19780656 90410102000523021141101001101101002320334244
GLM 19780656 90410000000001000011111111111111111244403
GCM 19850463 90390210131401040020100000001100010320223222
GCM 19850463 90390000010000110011111111111111110244402
GTM 19840862 90380014131404041141111111101111104320444444
GTM 19840862 90381111111111111101111111111111111110244404
GSM 19820660 90370303020522020021100001101100001021011114
GSM 19820660 90370000000000000011000011000110122240 3
GEM 19830456 90360300130102040000111001101100110120333244
GEM 19830456 90361100010111110011101010110110044444 3
GAL 19771154 90331000001404041141111111111111111114220444444
GAL 19771154 90331111111111111111111111111111111114444444
GTM 19840556 90350414131404040020101001101100110310244344
GTM 19840556 90351111111101111101111111111111111114444444
GSM 19841061 90340300130122020030100001101100012220213113
GSM 19841061 90340000000001000011100111111111012244 03
GSM 19820955 90320000000103040020100001101101011341222122
GSM 19820955 90320100000111001011001111111110022440 4
GLM 19790857 90310004021413040041100000000101012221234333
GLM 19790857 90311111111111111111111111111111111114444442
GLM 19830861 90291401131404040021111011101101010010333333
GLM 19830861 90291111111111111001110111111111104444444
GLM 19830761 90280302020313010011111001101100010310111133
GLM 19830761 90280000000000000001    000101100224404
GLM 19810750 90260314061423041141100001100001102001214224
GLM 19810750 90260100000001000000111111111111102244 02
GEM 19790557 90250203000132040020100001100000011320004013
GEM 19790557 90250000000000000000010111111111111224303
GEM 19830560 90240300020113020000100000000000000301012000
GEM 19830560 90240100000111000000100000111110122430 4
GEM 19840862 90230300020122040020101001101100002321114134
GEM 19840862 90230000000111010011011111111111102244 03
GAL 19771154 90220314000132040021100001101100012311114024
GAL 19771154 90220100010111110011111111111111111224400
GAL 19760954 90200014130102040041111001101101111220334244
GAL 19760954 90201100000001110011111111111111114344444
GLM 19830157 90190301020100040021100000000101001120244111
GLM 19830157 90190000000000110000101000001110444444 4
GLM 19800657 90170114020112041120111001101101012210224133
GLM 19800657 90170000010000110011111111111111111224403
GCM 19840662 90150000130102040010100001101101000320222233
GCM 19840662 90151100010001110011100011000110124444 4
GLM 19790357 90140314020323021021100001100000001320133113
GLM 19790357 90140000000000000000100000110110024444 0
```

GSM 19821059 90130304130102041000101001101101011341224134
GSM 19821059 90131110010111110001111111111111111424404
GSM 19831261 90120300130102040000111001101101112231333234
GSM 19831261 90121111111111111101110110110011104444443
GLM 19840161 90080302130012120000101001101101001220002022
GLM 19840161 90080100000001110011100000100110022441 4
GEM 19820748 90111403130004320010100001101100002231234124
GEM 19820748 90111111111111111111110001111111144444444
GTM 19840862 90100314000142040141100001100000011341013 01
GTM 19840862 90100000000000000000111111111111111224302
GTM 19810460 90090010131404040141111001101101112310444444
GTM 19810460 90091111111111111011111111111111110224444
GCA 19820258 90070314000112041141100011101001002031324314
GCA 19820258 90070000000000000000111111111111110244400
GSM 19830861 90040303000112010000101001100000000221112134
GSM 19830861 90040000000001110011011111111111111224444
GCM 19840962 90030301130112020010100000000000100012000 3000
GCM 19840962 90030100000000000000100111101110122100 2
GEM 19830861 90020000130114040020100000001101012241223112
GEM 19830861 90021100000001111011101111110110444440 4
GEM 19790549 90010404001400040000110001100101010210223134
GEM 19790549 90011100000000110011100001010000444441 4
GLM 19850563 9120030305063 2200 01000000000000000120002000
GLM 19850563 91200000000000000000011111111111111224403
GAL 19820760 91490200020102020020100000000000000241014000
GAL 19820760 91490000000000000000011111111111111224403
GEM 19810259 90181304000122040000111001101101112341234244
GEM 19810259 90180100000111000011011111111111111224400
GLM 19800558 90680200021403040020100001101101010320344223
GLM 19800558 90681111111111111111111111111111114444444
GAL 19830358 91500300000142020020100000000000002340214112
GAL 19830358 91500000000000000000011111111111111224403
GLM 19840658 90060004001412040021111001101101111310223244
GLM 19840658 90060000000001000011111001110111112444 04
GEM 19830161 90051404131404040000111010101101110330444444
GEM 19830161 90051111111111111111111111111111114444444
GCA 19810659 90600314130102040030100001001101012320234113
GCA 19810659 90601100001101000011111111111111111224444
GEM 19791156 90770100131104040020100000101101112120124113
GEM 19791156 90771100010001110011111111111111110444444
GLM 19810353 90440304011402040000111001101100111231344244
GLM 19810353 90441111111111111111111111111111114444444

Appendix F: Instructions for Future Research

1. The first thing that should be done before this research is repeated is to improve the survey instrument. Several of the questions should be modified in order to make the analysis easier and more meaningful. A list of the questions that this researcher believes should be changed and the recommended changes may be found at the end of this set of instructions. Be sure to let the faculty members that have an interest in the computer courses have an input to the survey questions. There may be 'one-time-good-deal' questions such as question 34 on the survey used for this research.

2. As soon as possible, obtain the names, addresses, and option identifiers of incoming students from AFIT/LSG. They should be able to provide you with mailing labels at the same time. Also obtain answer forms and mailing supplies from this same section. Number the list of incoming students and also number the answer sheets in an inconspicuous manner. When you mail out the surveys, be sure that you match the correct survey package with the correct address label according to the numbers. This will enable you to fill-in the option identifier for those respondents that leave the answer blank. A large number did for this research.

3. Mail the surveys out as soon as possible to give the respondents ample time to respond and you ample time to work with the data. Doing so will provide more time for the faculty to respond to the results.

4. Once the answer sheets have been returned, have them read optically into a file on the VAX. This file should be edited for missing data that could result from light pencil marks. Corrections must be made before the data is analyzed. Use the program 'DATA.SAS' to obtain a printout that you can edit. This program, along with the other SAS programs provided in this research, may have to be altered to run with your data file. The change you may have to make concerns telling the program where to find the information in your data file. This is accomplished with the 'input' statement by assigning information that is located in a specified column in your data file to a variable. If you have specified incorrect columns, the program will not run. The programs shown in Appendix B are designed to work with a data file that has been created by using the optical scanner. The data will not appear as it does in Appendix D. This data was edited to fit within the margins required for printing and, except for the line divisions, is not in the form obtained from the optical scanner.

5. Use the SAS programs 'FREQ.SAS' and 'H_BAR.SAS' to obtain an initial analysis of the data. This will provide frequency tables for all the questions and will also provide bar charts of the data. This is the information that should be of interest to the faculty developing the introductory computer courses.

6. Other research hypotheses may be evaluated with the SAS programs 'CORR', 'OPTION' and 'EASY'. These programs, which are described in Appendix B, should provide a good starting point for future research.

7. Good-luck with your research and thank you for carrying on mine.

Questions to be Modified

Question	Fix
2 & 4	Need to change answer 'a' to state '1 - 6 months.' As it is, a person that does not use a computer may select 'a' or 'e'
5	Delete, covered in question 6.
6	Statement in parenthesis should be (If more than one, mark the one used most often). This will keep you from having to manually input data.
13	Break this question up into mainframe instruction and PC instruction and between college and the AF. As the questions is, you can not tell where the education is coming from, nor what they have been instructed in.
14	Delete, covered in question 15.
33	Delete, not important.
34	Delete unless there really is a chance for the program to start.
ADD	Add more questions like 69-75. The survey requires more questions on the VAX so that the variable VAXSCORE will be more meaningful. Also, add questions about using DBase type programs.
Change	It may make taking the survey easier if the questions were grouped into categories better than they presently are.

Appendix G: Program Options

Students attending AFIT's School of Systems and Logistics have been assigned to one of six graduate programs. Within one of the programs, the Graduate Logistics Management Program, there are five program majors: Acquisition Logistics Management, Inventory Management, Logistics Management, Maintenance Management, and Transportation Management (1:165-179). The six graduate programs and five programs majors are considered to be "program options" by those attending the school.

A list of the program options and acronyms that will be used in this research follows. The Maintenance Management program option is not included because it was not offered during the period of this research.

Graduate Acquisition Logistics - GAL

Graduate Cost Analysis - GCA

Graduate Contracting Management - GCM

Graduate Engineering Management - GEM

Graduate Inventory Management - GIM

Graduate Information Resorce Management - GIR

Graduate Logistics Management - GLM

Graduate Systems Management - GSM

Graduate Transportation Management - GTM

Bibliography

1. Air Force Institute of Technology. 1987-1989 Catalog. Wright-Patterson AFB OH, AFIT/RR, 1988.

2. Babbitt, Bettina A. and Charles O. Nystrom. Questionnaire Construction Manual. Contract MDA903-83-C-0033. ARI Field Unit - Fort Hood, HQ TCATA, Fort Hood TX 76544, March 1985.

3. Bass, Brad. "Zenith Manuevers Through Stream of AF Orders," Government Computer News, 7: 51 (June 1988).

4. Conover, W.J. Practical Nonparametric Statistics. New York: John Wiley and Sons Inc., 1971.

5. Defense Logistics Agency. Technical Report Summaries. Search Control No DK000E. Defense Technical Information Center, Cameron Station, Alexandria VA 22304-6145, 20 October 1987.

6. Emory, C. William. Business Research Methods (Third Edition). Homewood IL: Irwin, 1985.

7. Hager, Peter. "Agencies Double Their Micro Buys in 1985," Government Computer News, 5: 72 (August 1986).

8. Lassnoff, Lt Cynthia S. Training Requirements for Microcomputer Users. MS thesis. Naval Postgraduate School, Monterey CA, December 1986 (AD-A177-389).

9. Luther, Capt Paul E. A Requirements Analysis for Implementation of a VAX-Based Microcomputer Environment at AFIT. MS thesis, AFIT/GSC/MA/86D-6. School Of Engineering, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, December 1986 (AD-A178-491).

10. McCauly, Maj Bob., Assistant Professor of Logistics Management. Personal Interview. Air Force Institute of Technology, School of Systems and Logistics, Wright-Patterson AFB OH, 15 July 1988.

11. McClave, James T. and P. George Benson. Statistics For Business and Economics (Third Edition). San Francisco: Dellen Publishing Company, 1985.

12. Novak, Joseph D. and D. Bob Gowin. Learning How To Learn. New York: Cambridge University Press, 1988.

13. Osgood, Donna. "A Computer On Every Desk," BYTE, 9: 162+ (June 1984).

14. Peschke, Lt Col Richard E. Head, Department of Quantitative Management. Personal Interview. Air Force Institute of Technology, School of Systems and Logistics, Wright-Patterson AFB OH, 10 Nov 1987.

15. Phillips, Bernard S. Social Research Strategy and Tactics (Third Edition). New York: The Macmillan Company, 1971.

16. Pournelle, Jerry. "Off We Go," BYTE, 11: 299-230 (August 1986).

17. SAS Institute Inc. SAS Introductory Guide (Third Edition). Cary NC: SAS Institute Inc., 1985.

18. -----. SAS User's Guide: Basics, Version 5 Edition. Cary NC: SAS Institute Inc., 1985.

19. Selltiz, Claire and others. Research Methods in Social Relations. New York: Holt, Rinehart and Winston, 1964.

20. Siegel, Sidney. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill Book Company, 1956.

21. Solorzano, Lucia. "Computers on Campus: The Good News, Bad News," US News and World Report, 99: 60-61 (October 1985).

22. Suydam, Bill. "Services Under Pressure to Firm Up Standards," Government Computer News, 7: 63-65 (March 1988).

23. Weaver, Dr. Robert B., Associate Professor of Communication. Personal Interview. Air Force Institute of Technology, School of Systems and Logistics, Wright-Patterson AFB OH, 24 June 1988.

24. Williams, R. "Plebes Add Computing to Saluting," Government Computer News, 5: 1 (September 12, 1986).

VITA

Captain Richard C. Lenz [redacted] in 1975 [redacted] attended the University of Georgia, from which he received the degree of Bachelor of Science in Biology in December 1979. He received his commission from Officers Training School in October, 1980. He completed pilot training and received his wings in July, 1981. He served as an HH-3E pilot in the 38th Aerospace Rescue Recovery Squadron, Osan AB, Republic of Korea from 1982 to 1983. [redacted] From 1983 to 1985 he served as an aircraft commander, flight instructor, and flight commander for the 703rd Tactical Air Control Squadron, Shaw ABF, South Carolina. He served as Assistant Chief Standardization and Evaluation Division for the 507th Tactical Air Control Wing, Shaw AFB, South Carolina from 1985 till entering the School of Systems and Logistics, Air Force Institute of Technology, in May 1987.

[redacted]

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GLM/LSQ/88S-41	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics 6b. OFFICE SYMBOL (If applicable) AFIT/LSM	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology (AU) Wright-Patterson AFB, OH 45433-6583	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

AN ANALYSIS OF COMPUTER SKILLS POSSESSED BY AFIT CLASS 89S/D

12. PERSONAL AUTHOR(S)
Richard C. Lenz, Capt, USAF

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
MS Thesis	FROM _____ TO _____	1988 September	141

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Computers, Micro-computers, Computer Training, User Needs, Education Training, Skills
05	06		

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Thesis Chairman: Richard E. Peschke, Lt Col, USAF
Head, Department of Quantitative Management

Approved for public release IAW AFR 190-1.

WILLIAM A. MAUER 17 Oct 88
Associate Dean
School of Systems and Logistics
Air Force Institute of Technology (AU)
Wright-Patterson AFB OH 45433

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Richard E. Peschke, Lt Col	22b. TELEPHONE (Include Area Code) (513) 255-6289 22c. OFFICE SYMBOL AFIT/LSQ

DD Form 1473, JUN 86 *Previous editions are obsolete.*

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

The purpose of this research was to discover the level of computer knowledge incoming AFIT students possess. This information was attained through a mail survey before the incoming class arrived. Much of the information attained from the survey is presented using descriptive statistics. Five hypothesis were tested.

The first two hypotheses attempted to correlate a respondent's college graduation date and birth date with computer knowledge. The third attempted to show a dependence between a student's program option and computer knowledge, and the fourth and fifth were tested to determine if the student's environment is dominated by a particular computer.

The research found that there is a correlation between a respondent's graduation date and knowledge of a mainframe computer, but not between graduation date and a PC, and that there was no correlation between a respondent's birth date and computer knowledge. It was also determined that program options were not a good indicator of computer knowledge, and that MS-DOS computers dominate the home and work environment of incoming AFIT students.

A recommendation was made to continue the research in order to provide the demographic information to the AFIT faculty responsible for the computer courses.